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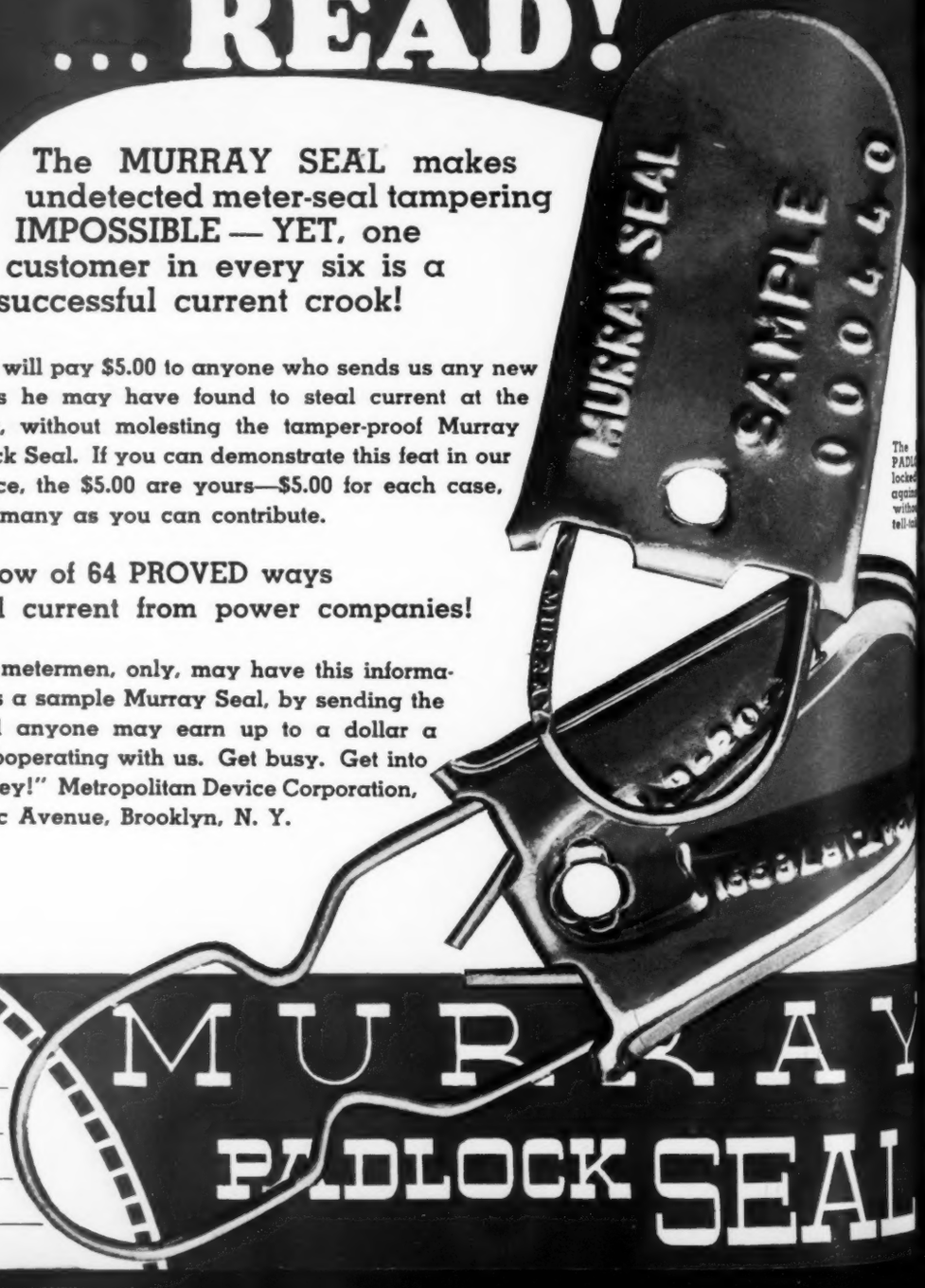

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ELECTRICAL WORLD

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OCTOBER 8, 1938

VOL. 110, No. 15

CONTENTS

Public Relations for American Industry 53

A presentation with especial reference to the electrical utility industry of the imperative need for mutual understanding in the conduct of our daily work.

Clark's Falls Hydro Designed for Reliability 46
By L. G. ROPES, *Chas. T. Main, Inc.*

Adapting Purchased Power to Brewery Requirements 48
By EUSTACE C. SOARES, *The R.B. Engineering Corporation*

School Lighting Improved in 300 Classrooms 51
By HOWARD M. SHARP, *Buffalo, Niagara & Eastern Power Corporation*

Phase Shifter's Function in System Development 52
By C. S. ROODHOUSE, *Nebraska Power Company*

Advanced Methods of Control Room Lighting 77
By W. B. MORTON, *Philadelphia Electric Company*

Carter Field on Washington Events 82

Letters to the Editor 43
Editorials . . . . . 45 and 80
News of the Week 83
Field Operating Practices 91
Industrial Electrification 96
New Engineering Ideas 100
Building Up the Load 104
New Equipment Available 108
News About People 114
Manufacturing and Markets 120
Municipal Plants 124
Rural Allotments; Contracts Awarded 126
Sales Opportunities 128
Book Reviews 133

Index of Advertisements 138

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JAMES H. McGRAW, Founder and Honorary Chairman

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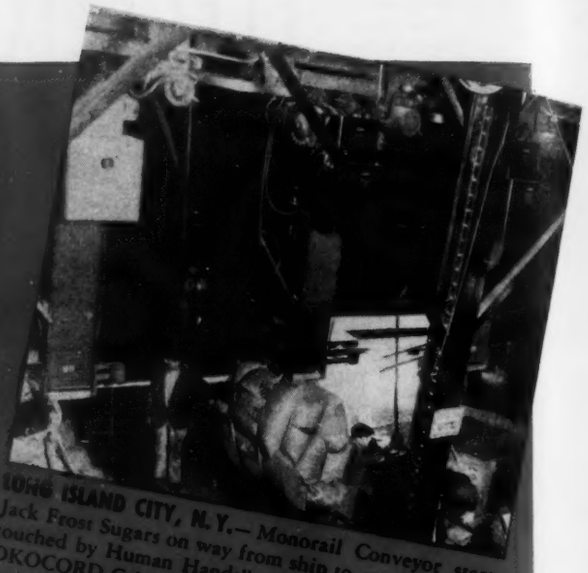
BERMUDA— Okonite Cable transmits power for lights and provides telephone communication for Dr. Beebe in the New York Zoological Society's Bathysphere ½ mile down in the depths of the ocean. Pressures encountered were so great that several feet of cable were forced through the stuffing box at the depths encountered — So resilient was the insulation that no leaks or shorts occurred.



LONG ISLAND CITY, N.Y.— Monorail Conveyor starts Jack Frost Sugars on way from ship to consumer "Untouched by Human Hands". A 10-conductor portable OKOCORD Cable provides the proper circuits to control the operation of the conveyors.

Installations Illustrated

A pictorial record of the successful use of Okonite wires and cables under extraordinary and unforeseen conditions.

OAKLAND, CAL.— Alameda Airport, base for Pan-American Trans-Pacific service receives power and light through OKO-SHEATH Cables, buried in salt bearing tide lands. This service demands the utmost in resistance to corrosive soil conditions.

MAYWOOD, ILL.— Adjacent to this cable conduit are mains carrying high pressure steam at 350° F. through a 2000 ft. tunnel to a school annex. To prevent insulation deterioration from resulting high temperatures the logical selection was OKOGLASS heat-resisting cable free from organic materials.

You, too, may have a wire or cable problem that is tough to lick. If so, write us and let our engineers consult with you regarding it.

1938 Marks Our 60th Year of Service

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Founded 1878

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Letters TO THE EDITOR

Co-operation for National Defense

To the Editor of ELECTRICAL WORLD:

Thank you for sending me a copy of the article "Committee to Study Power Supply Facilities for War Emergency" (ELECTRICAL WORLD, September 17, 1938, page 7).

I am especially grateful to you for those last two paragraphs, which make it quite clear that our study of power resources is in no way intended as an attack on the public utilities, but, on the other hand, is an effort to foster co-operation between the government and the power industry for purposes of national defense.

LOUIS JOHNSON,
Assistant Secretary of War,
Washington, D. C.

•

Saving Labor in Rate Studies

To the Editor of ELECTRICAL WORLD:

Much time and labor can be saved in the preliminary steps underlying the design of new rates if a suitable number of samples, rather than the entire number of bills, is used for determining the frequency-distribution of customers' bills according to kilowatt-hours used. For example, if a company serves 25,000 customers a sample of 5,525 bills is sufficient for practical purposes.

Conventional sampling theory is concerned with the estimation of the mean of the entire lot (universe) from the mean of the sample. As a basis for rate work, however, the mean of the universe is of little value, the essential data being a frequency distribution of the bills rendered according to kilowatt-hours sold. The accuracy with which the relative frequencies of a sample approximate those in the universe may be made as close as desired by increasing the sample size. Therefore, if this accuracy is specified, the equation may be solved for the required sample size. This formula is obtained by estimating the sample required for each class interval of the frequency distribution, and summing. In the formula, P is the percentage size sample, as a decimal; a is the desired accuracy of the relative frequencies, also as a decimal; t is taken from the table of the normal probability integral, and N the number in the universe.

$$P < \frac{t^2}{a^2 N + t^2}$$

The $<$ sign, generally read "less than," is more appropriately read "not more than" in this case, since this formula gives the maximum sample.

Considerable difficulty is sometimes encountered in deciding on a value for t, consequently the following table is appended. A good idea of what any given individual may consider a sufficiently high probability for action can be obtained by the following example:

Suppose a man holds two coins, looking identical at a distance of twenty feet. One coin is true, but the other is false, having two heads. One of these coins is chosen at random and tossed, the results being noted. How long a run of heads would have to result before you would care to bet that the coin being tossed was the false one? The probabilities of getting a run of n heads with an honest coin honestly tossed, together with the equivalent t^2, is tabulated below.

Runs	t^2	Probability
1	0.455	0.5000
2	1.322	0.2500
3	2.356	0.1250
4	3.471	0.0625
5	4.644	0.0313
6	5.856	0.0156
7	7.076	0.0078
8	8.329	0.0039
9	9.610	0.001956

Good practice is to use values of t^2 between four and nine. The application and interpretation of the formula is as follows: Suppose that 100,000 bills have been rendered in a community over a period of one year and it is desired to take a sample of sufficient size that the relative frequencies in each block will differ by less than 0.2 from the real frequencies. It is further desired that the probability be about 0.90 that this will happen.

If the number of bills rendered is very large the correction factor for the universe size is not significant and the formula simplifies to

$$N = \left(\frac{t}{P}\right)^2$$

which will always give a safe answer.

From tables of the probability integral, found in any text on statistics, the value of t corresponding to a probability of 0.90 is 1.6449, therefore t^2 is 2.7077. Substituting

$$P < \frac{2.7077}{(0.02)^2 \times 100{,}000 + 2.7077}$$

$$P < 0.0649$$

The interpretation, therefore, is that if, from a universe of 100,000, a truly random sample of 6.49%, or 6,490 units, is taken, the probability is nine to one that the relative frequencies in each block will differ by less than 0.02 from the real frequencies, as given by the entire 100,000.

EDWARD F. WILSON,
Cambridge, Md.

•

Brewery Power Data

To the Editor of ELECTRICAL WORLD:

Would it be possible to get copies of the following data sheets as printed in the ELECTRICAL WORLD during 1936? The title of these sheets is "Electrified Breweries," which appeared in Vol. 106. The page numbers are 2088, 2225, 2535, 2728 and 2882, July 4 and 18, August 15 and 29, and September 12.

J. C. O'NEAL,
Industrial Power Department
Consolidated Gas, Electric Light & Power Company of Baltimore.

[Despite the demand for these reprints there is a small stock available to supply such requests not only for the brewery data sheets but for those on bakeries and laundries.—EDITORS.]

•

Golden Anniversary Banquet

To the Editor of ELECTRICAL WORLD:

Thank you for your letter of September 20 inclosing a clipping from the ELECTRICAL WORLD, issue of September 20, regarding my Golden Anniversary banquet. I was presented with a "Memory Book" at the party and I shall take pleasure in inserting your letter and clipping in it.

Your publication has been in our library for 50 years to my knowledge and I presume the Thomson-Houston Company was one of your first subscribers.

G. S. JAMESON,
Supervisor Order and Stores Dept.
General Electric Company, West Lynn, Mass.

NOW

A MAJOR ADVANCE IN D-C INSTRUMENTS

The G-E Concentric-magnet Design

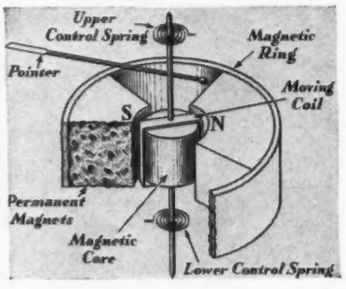
1. d'Arsonval Instrument
2. Magnetic Vane Instrument
3. Electrodynamic Instrument and NOW
4. Concentric-magnet instrument

IT'S NEW

In the past, most instruments were classified under three headings. But now, with General Electric's development of Alnico — an alloy of unusual magnetic strength — there's a new addition: the CONCENTRIC-MAGNET instrument for accurate d-c measurements. This marks a big step ahead in measurement technique.

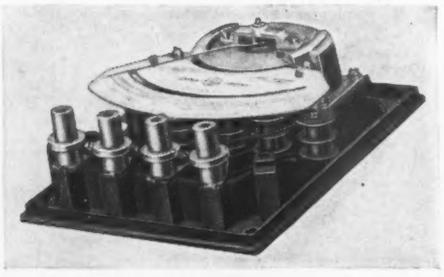
WHAT it is

Concentric-magnet construction consists of a soft-iron ring completely encircling two sector-shaped Alnico magnets or pole pieces — between which are a moving coil and a magnetic core.



This permits the design of a circuit which is not only self-shielded, but is also magnetically self-contained. Sensitive devices located near the instrument are substantially unaffected.

WHY you get better d-c measurements this way

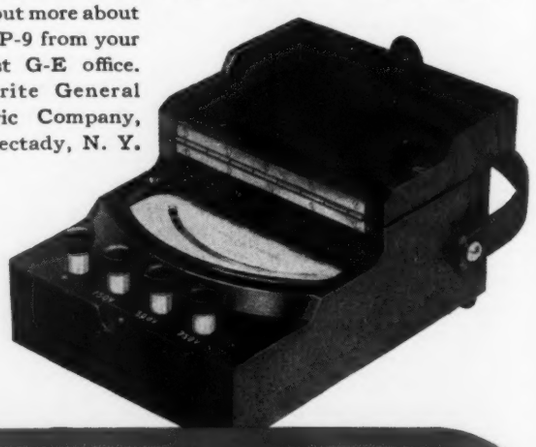


WHY? Because only with G-E concentric-magnet construction can you get (1) an element that's self-shielded magnetically, with (2) an unusually high air-gap flux density. The first minimizes effects of stray magnetic fields — makes for accuracy under actual operating conditions. The second provides more torque and great dependability in all ratings. In short, you can now get a highly sensitive, quick-indicating d-c instrument.

HOW IT HELPS YOU

This new portable d-c instrument, Type DP-9, is General Electric's newest contribution to savings obtained from accurate measurement. It's a medium-sized unit — fits in your overcoat pocket. And it's an instrument with new capabilities for sure, sensitive d-c measurements.

Find out more about the DP-9 from your nearest G-E office. Or write General Electric Company, Schenectady, N. Y.



HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

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ELECTRICAL WORLD

OCTOBER 8, 1938

A Personal Matter

The Number One job of American industry, as one man put it, is improving public relations. Business men generally will probably agree with that statement, but, and it is a great big "but," what are public relations? That is what is puzzling so many executives. Some people think it is one thing and others think it is something else.

As near as we can find out, public relations starts at the bottom and begins at the top. That sounds strange, but what it really means is that public relations to be successful must start with good employee relations, and that the effort to secure good relations must begin in the mind and attitude of management.

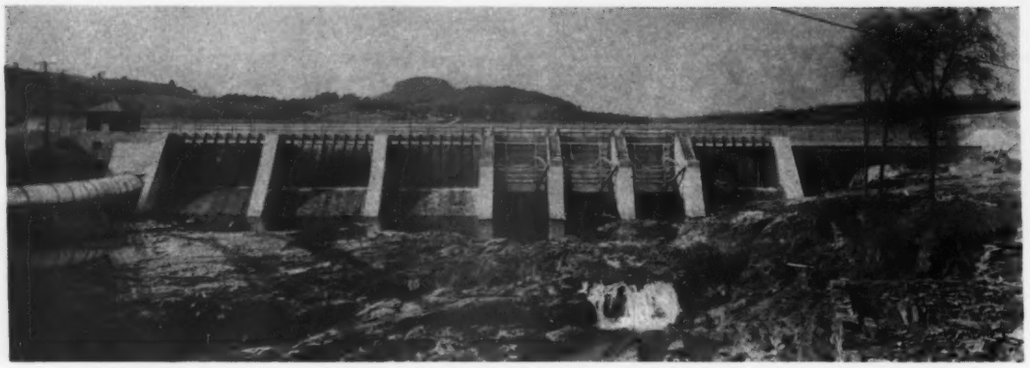
This issue of ELECTRICAL WORLD contains a public relations insert specially prepared for the electrical industry. It outlines the need for better public understanding, and suggests the elements of a program as well as a graphic method for presenting facts quickly. It is but the beginning of a long-term editorial effort to help the electrical industry in its effort to build better public relations.

While much of the material in this insert is of such a nature that it can be readily used in its present form for employee and public education, it must be looked upon as an aid and not a crutch. Public relations is a personal matter. When it becomes impersonal—something that one can take out of a book or hire an outsider to handle, and thus relieve management of the effort—it fails. All that independent public relations counsel can do is to help organize and guide a program and advise. The work itself must be done by management.

Thus, relations with employees to be good must naturally be based upon policies mutually arrived at and accepted by management and employees. Because it is a matter of human relations it must be handled in a personal manner, with all concerned having and wanting a feeling of confidence and respect for each other. One of our troubles today is that the two sides do not see enough of each other. The boss must find time to get out more among the employees.

Likewise, relations with the public is not entirely a matter of advertising or other forms of publicity. It, too, is personal. The executives, whether they be the tops of a large operating property or local managers, can make themselves a definite part of the business, social and civic welfare of their communities. How many executives, for instance, show any personal interest in the rank and file of their customers? The big customer, while important from a revenue point of view, is relatively unimportant when it comes to public relations. In the metropolitan centers, of course, mere numbers limit one's activities, but in smaller places, where there is a community spirit, the personal touch is most important.

In other words, public relations means human relations, which, simply translated, means getting along with the people who work for us and the people we do business with. It isn't something we can buy. Nor does it come in a standard package. It takes a lot of hard work, and time and patience. Yet the best results will come from directness and simplicity, provided always that management has shown a sincerity and integrity of purpose.



Downstream face of dam, showing penstock, stanchion type flashboard structure and Tainter gate sections

By L. G. ROPES
Chas. T. Main, Inc.
Boston

Clark's Falls Hydro Designed for Reliability

WITHIN an 8-mile stretch the Lamoille River in northern Vermont now drives the turbo-units of three generating plants belonging to the Public Electric Light Company of St. Albans. Utilization of stream flow is highly economical and service reliability features this work. The plant at Fairfax Falls contains two 2,000-hp. units operating under 80-ft. head; one at Milton, 8.5 miles below, has a 4,500-hp. unit under 95-ft. head, with provision for another unit of the same capacity later, and at Clark's Falls, 2,500 ft. above Milton, is the latest development of the company, embracing a 4,000-hp. unit operating under 41 ft. head and arranged for self-synchronizing with automatic remote control from the Milton switchboard. This development was designed by Chas. T. Main, Inc., engineers, Boston.

The new dam at Clark's Falls provides for the storage of about 200,000,000 cu.ft. of water, the pond area being about 350 acres when full. The dam has a concrete section about 400 ft. long with a maximum height of 40 ft. At one end an earthfill dike about 450 ft. long and 20 ft. high raises the water level about 28 ft., which made necessary the relocation of a concrete highway about 4,000 ft. long at the other end of the dam. This dam is designed to discharge safely a flood in excess of the November, 1927, flood, or about 85,000 c.f.s. with a pond level rise only 2 ft. above normal. The dam has three Tainter gates, each 24 ft. wide x 23 ft. 6 in. high, and four sections of stanchion flashboards 42 ft. 6 in. wide x 20 ft. 6 in. high, besides a free overflow spillway 100 ft. long. A bridge extends over the Tainter gates and stanchion flashboard sections, supported on the piers which separate the sections.

Clark's Falls plant, showing penstock, forebay with remote-controlled Broome gate hoist and use of glass brick in superstructure

The stanchion flashboard sections consist of steel beam stanchions about 5 ft. on centers, supporting the flashboards. The upper ends of the stanchions are supported from the bridge by a latch which can be easily and quickly released by a trigger. The three Tainter gates will discharge a flood of about 30,000 c.f.s., which exceeds any flood on record except that of 1927. Because it is expected that none of the stanchion flashboards will have to be released except on rare occasions, no provision has been made to save the stanchion beams. Each Tainter gate is operated by a separate 25-ton hoist located on the adjacent pier, the hoisting drums being mounted on a 14-in. diameter stainless steel tube which spans the opening between piers.

One of the Tainter gates can be operated by remote control from the Milton plant, a position indicator being provided to show the extent of gate opening. In emergency this feature is extremely valuable.

To prevent freezing along the sides and bottom of the Tainter gates electric heaters were installed in a steel box set in the face of the concrete pier and in a box formed in

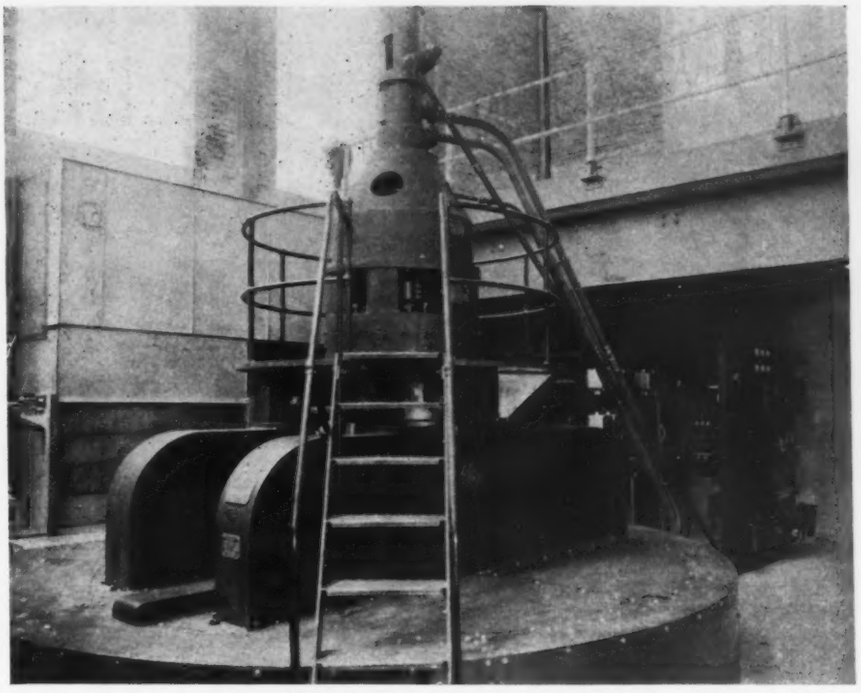
the bottom of the gate. A compressor of about 100 cu.ft. capacity per minute is located in a small house at the end of the dam and this supplies air to agitate the water in front of the Tainter gates, stanchion flashboards and intake to prevent freezing. The receiving tank is located in the room with the compressor, and from this point air is conducted through pipes laid in a trench in the bridge floor and insulated with asbestos covering. These air pipes lead down through the bridge piers and connect to headers on the upstream face of the dam immediately below the bottom of the stanchion flashboards and Tainter gates. The nozzles are about 6 ft. apart on centers. In this way the air which is heated by the compression retains most of its heat until it is liberated at the nozzles, and it is anticipated that there will be no trouble from the freezing of the air pipes due to entrained moisture. Steam is also available for ice removal around the Tainter gates and stanchion flashboards.

Surges damped

At one end of the dam there is an intake to a 12-ft. diameter riveted steel plate penstock about 400 ft. long, which terminates in an open forebay provided with a free spillway. As there are no gates at the intake, the penstock is always full and did not require anchoring to overcome possible uplift during a flood, when the penstock will be submerged.

The forebay is provided with a concrete slab just above the top of the penstock with a restricted opening designed to damp surges and improve regulation. It is equipped with two 10-ft. 3-in. x 11-ft. Broome gates, motor-operated with 20-ton hoist by remote control from the Milton plant.

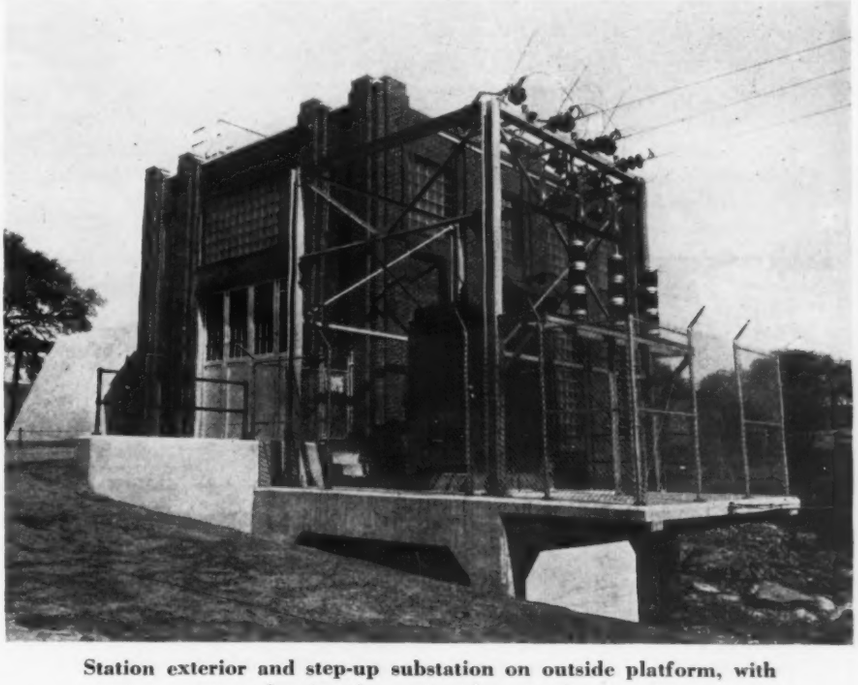
The power house has a 3,000-kw., 240-r.p.m., 2,400-volt General Electric generator, direct-driven by a vertical Kaplan type waterwheel built by the S. Morgan Smith Company and having a direct-connected exciter, pilot exciter and Lombard oil-pressure governor of 35,000 ft.-lb. capacity. The station is designed so that the equipment can be kept in operation during a flood exceeding that of 1927, concrete walls being carried above the flood level without doors or windows and a sump pump provided to handle any seepage. To reduce the length of shaft the generator has been set below the flood level, but a landing floor has been provided above. The station has a concrete substructure with elbow type draft tube and tailrace which required a maximum excavation of 30 ft. in hard rock, a reinforced concrete scroll and brick superstructure with steel framework and a reinforced concrete roof. A 20-ton Shaw crane of the hand-operated type has been provided.



Interior of station showing generating unit, remote control switchboard and ventilating duct, with flood protection of substructure

A feature of the power house construction is the use of glass brick in the superstructure in place of ordinary steel sash windows. An attractive exterior is obtained by using this glass brick in large panels with tall brick piers between the bays. Vertical lines are emphasized to increase the apparent height of the superstructure, to offset the height of the concrete substructure made necessary by flood-protection require-

[*Continued on page 50*]



Station exterior and step-up substation on outside platform, with fencing for external protection

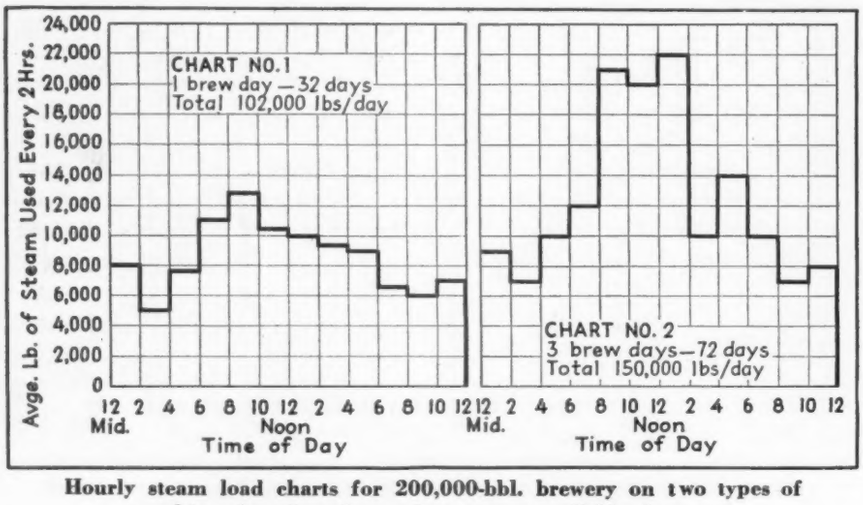
Adapting Purchased Power to Brewery Requirements

Analyses Show 70 per Cent of Load Can Be Saved Despite By-product Steam Competition

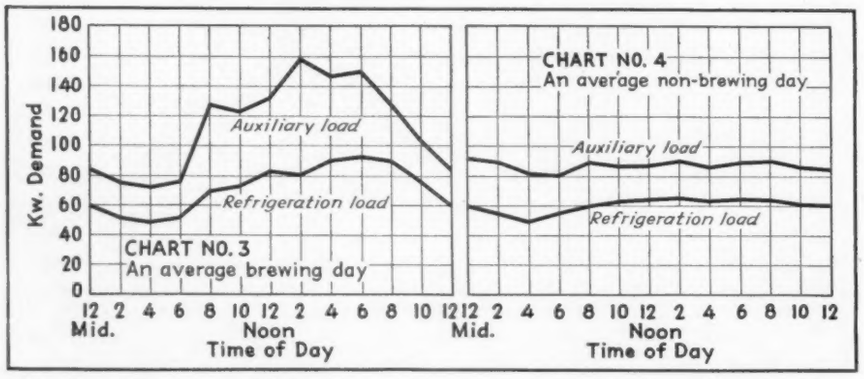
By EUSTACE C. SOARES

Treasurer the R. B. Engineering Corporation, New York, N. Y.

IT IS a more or less generally accepted belief among plant owners and engineers that where process steam is required in the manufacture of a product it is cheaper to generate all power requirements than to buy all or any part of it. While a brewery does require a fairly large quantity of process steam in the manufacture of the product, it is a rare case indeed where an existing brewery cannot afford to purchase about 70 per cent of its total power requirements and arrive at the best economical set-up. This statement presupposes that the brewery refrigeration and steam system is improved to give economical operation. Actually the vast majority of breweries have poor and wasteful refrigeration and steam systems. This statement does not consider also those cases where a brewery can best use all purchased power effectively.



Hourly steam load charts for 200,000-bbl. brewery on two types of working day show by-product steam available does not coincide with power requirements (see below)



Purchased power requirements on two common types of working day for 100,000-bbl. brewery show favorable load. Peak on brewing day is reduced by increasing time for wort cooling

In an accountant's survey covering breweries throughout New York State it was found that for breweries producing and selling 125,000 bbl. or more per year the total unit manufacturing cost per barrel was \$3.8097, whereas fuel, power and water amounted to \$0.1746. For breweries producing and selling less than 125,000 bbl. per year the respective costs were \$3.9029 and \$0.2562.

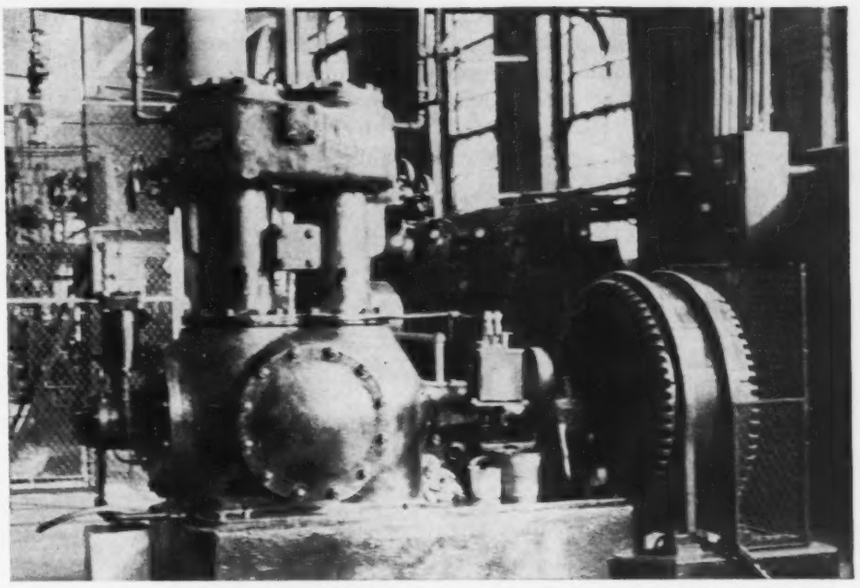
The manufacturing costs above referred to include materials used, salaries and wages, fuel, power and water, miscellaneous supplies, repairs to buildings, machinery and equipment, real estate taxes, depreciation of buildings, machinery and equipment and miscellaneous. The above costs do not include administrative or selling expense, nor do they include any bottling department expense, except that they do include all fuel, power and water used throughout the plant.

This combination of repeal conditions, quick production and low investment costs was ideal for the sale of purchased power. Particularly was this so when lower investment costs were considered. The result has been that today a good many breweries are utilizing purchased power, and this is especially true of breweries of 200,000-bbl. capacity or less. Al-

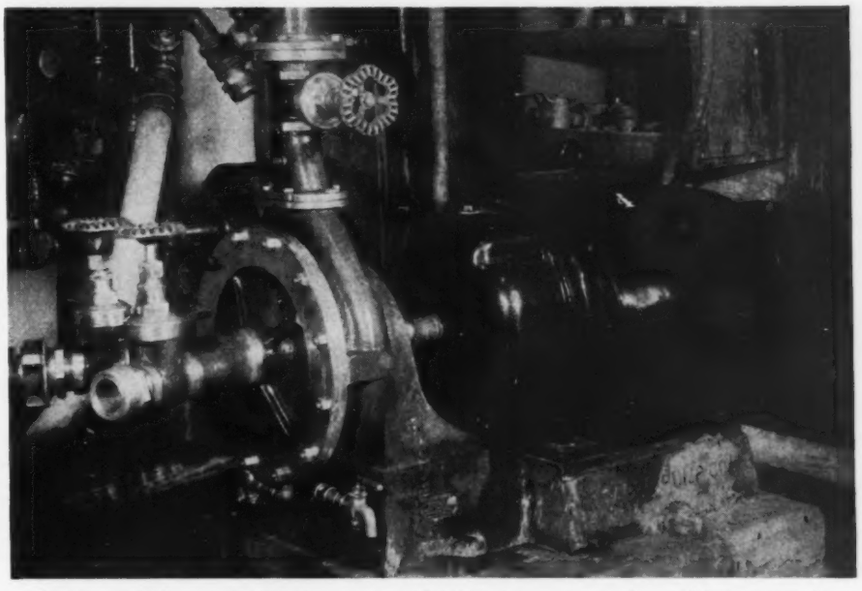
though they continue to use purchased power, they consider the cost of power as high and continue, partly along the line of least resistance and partly because of the financial problems involved, to remain as they are. This is the viewpoint of management and cannot be ignored by the progressive utility company.

The other angle, the economic viewpoint of the engineer, may be expressed by citing cases based on actual experience. At this point it may be well to point out the general truth that management's belief concerning the higher cost of purchased power is not owing in most cases to the inability of rate structures to meet the demands of the brewing industry, but rather to improper application of purchased power.

In a typical case with little capital investment we were able to cut the cost of purchased power by properly balancing the plant and rearrangement of piping for better refrigeration results. Reduction in costs from 15 to 30 per cent, with an average of 25 per cent, are the rule, yet increased business soon brings the power company revenue back to the original status, the only difference being that in the latter situation a satisfied customer is the result.



This 125-hp. synchronous motor-driven compressor provides all refrigeration for 100,000-bbl. brewery. The variation in capacity required in different seasons is obtained through clearance pockets



15-hp. splash-proof slip-ring motor driving beer pump in racking room is typical of new trend toward elimination of variable-speed motors

Rate schedules satisfactory

We have not had a single instance where a change in the rate structure was necessary, despite the reductions in operating costs that were made. It is decidedly the exception rather than the rule that rate structures are at fault.

In metropolitan centers, where also the larger brewery load exists, the rates are higher than in outlying cities and it becomes progressively harder for the utility to compete with brewery-made power. When rates average from 1 cent to 1.2 cents per kw.-hr. for the year it is possible to justify the use of all purchased power if the brewery requirements are properly balanced.

Another case, a brewery in the metropolitan area, purchases electric power and also generates power. This brewery was reported to be considering the purchase of new boiler equipment. A study of this brewery, however, clearly showed that purchased power was not being used effectively and for that reason was high cost power. The management knew it was high cost power, but did not know the condition could be rectified much cheaper than by buying new boiler and generating equipment.

Of recent years power companies by and large are taking a broader view of customer relationship and almost to a man are ready to do anything that will result in reducing power costs through economies, which ultimately always, of course, results in a more satisfied customer. There is much room for that sort of work in the brewery industry for many such economies can be made on a sound, self-paying basis.

In examining the component parts of a brewery's requirements we find that it consists of:

1. Steam for process work and heating.
2. Power for all auxiliaries and lighting.
3. Power for refrigeration.

Power for refrigeration is set apart from power used for brewery auxiliaries because it plays an important part in the analysis of power requirements. Power for refrigeration includes all equipment used to produce refrigeration such as compressors, exciters, condenser water pumps, etc.

In a brewery consuming 1,266,570

kw.-hr. per year, to produce approximately 200,000 bbl. of beer more than 900,000 kw.-hr. is covered under item 3—that is, power for refrigeration—and represents about 71 per cent of the total consumption.

The accompanying charts are based on average conditions in a 200,000-bbl. brewery and represent the steam consumption on the two various types of working days; that is, (1) one-brew days, 32 in number, and (2) three-brew days, 72 in number. Although, as will be seen, a fairly large quantity of process steam is used, the available steam does not coincide with the power requirements.

In such a brewery only about 300,000 kw.-hr. could be generated by process steam out of a total requirement of 1,266,570 kw.-hr. If we do not take into account possible labor complications and lessened plant simplicity the 300,000 kw.-hr. can be obtained quite cheaply. The brewery would set up a total maximum demand of approximately 400 kw., of which about 70 kw. could be generated.

Neglecting any question of labor problem, such a reducing turbine installation would cost $16,700 and earn $4,590 per year, about a 25 per cent gross return on the investment.

Figs. 3 and 4 show the refrigeration load for a brewing day and a no-brewing day in a 100,000-bbl. brewery, also the auxiliary power load separated from the refrigeration load.

It will be observed that the total power requirements are at a fairly high load factor on a non-brewing day, and although the load factor is not bad on a brewing day, there is a peak, which if smoothed out would improve the load factor.

If we balance the demand represented by extra refrigeration requirements during wort cooling, which lasts only about four hours per day, it will be possible to purchase the balance of the power requirements at a high load factor and correspondingly low unit cost, which will bring overall operating costs to a low unit level.

70 per cent can be purchased

In virtually every existing steam-operated brewery such an operating condition is possible and can easily result in the purchase of about 70 per cent of the brewery's power requirements. This means about 900,000 kw.-hr. in a 100,000-bbl. brewery. Monthly load factors on purchased power will vary between 55 and 75 per cent.

In a 100,000-bbl. brewery which has been modernized along the lines mentioned above and where none of the cellars are insulated, all purchased power refrigeration is being supplied by a compressor nominally rated at 65 tons of refrigeration driven by a 100-hp. motor. A comparison with other breweries will soon show how low this refrigeration requirement can be made.

The potential brewery business is large, amounts to from four to five kw.-hr. per barrel of beer, and is available provided sound engineering principles are applied to the refrigerating and steam system.

The question may now be asked, "How shall we get it?" The first thing to do is to clean house; that is, to make sure that breweries now using purchased power are doing so economically.

Next, the power company can go out and get the remaining business. It can be had in every case if you try to sell 70 per cent of the requirements. It is much more difficult to sell it, although it is practical in certain cases. You can compete with the existing plant on a 70 per cent basis, whereas you may not compete generally on a 100 per cent basis unless lower rate schedules are in effect than are generally available.

Clark's Falls Hydro Designed for Reliability

[*Continued from page 47*]

ments. Louver sections in the rear elevation of the plant and ventilators in the roof provide ventilation.

The generator is entirely housed in with an air discharge hood, ventilation being provided with a duct brought in through the basement and carried out at the generator floor. Ducts are equipped with motor-operated louvers controlled by a thermostat, so that air may be taken from the outside and discharged outside or recirculated in the building, depending on the temperature. Generator leads terminate in a 2,400-volt bus at the station, the energy is carried to a step-up substation outside the building, from which a 33-kv. tie runs to the Milton plant. Station service is at 230 volts. Provision has been made for manual control at Clark's Falls.

The automatic switchgear, also of General Electric design, functions as follows:

When the starting indication is given by the remote-control switch the governor opens the gates, releasing the brakes and allowing the wheel to start. At about 98 per cent synchronous speed the generator is connected to the line and the excitation is applied to the generator field. The machine then assumes load in accordance with the system frequency and the governor setting. The excitation of the generator field is of course determined by the voltage regulator.

When the stopping indication is given by the remote control switch the governor closes the gates. At the running-light position the generator is disconnected from the line, the exciter removed from the field and the brakes applied after a time interval.

Load control is accomplishd through remote control of the synchronizing motor on the governor.

The generator protection provides for differential, overcurrent, undervoltage, overheated bearings, overheated generator windings, field failure, low oil pressure, single or reverse phase, phase unbalance and overspeed. The operation of some of these devices for protection will lock out the generator and give remote indication at Milton.

Lightning protection is provided on the high- and low-tension sides of the transformer equipment, with station type arresters and a three-phase condenser on the generator bus. The control cable has a lightning arrester on each end of the conductor.

The step-up transformer is a 3,750-kva., General Electric, air-pressure-cooled unit with a rating of 3,000 kva. when self-cooled. Switchgear was factory-assembled. Each circuit breaker, with its disconnecting switches and instrument transformers, is mounted in a self-supporting structural steel framework with all wiring brought to terminal blocks on the structure. At the Milton plant remote indication is provided for the kilowatt load on the Clark's Falls generator, the water level at the dam and position of one Tainter gate. Each Tainter gate has three electric heaters which can be operated in three stages of 1.5, 3 and 6 kw., depending on the temperature.

School Lighting Improved in 300 Classrooms

By HOWARD M. SHARP

Manager Lighting Bureau, Buffalo, Niagara & Eastern Power Corporation, Buffalo, N. Y.

OUR first step has been to set up a technical standard. This was taken as 15 ft.-candles minimum in service for classrooms, with higher values for special areas. Quality of illumination was considered paramount, so only indirect or low brightness semi-indirect equipment was to be specified for seeing areas. Auditoriums, shops, corridors, etc., could follow typical practice for such areas.

The next step was the selling program. Informative literature is sent out from time to time to all school officials, P.T.A. officers and public health officials. The lighting salesman in each district maintains close personal contact with the school authorities. On every new project the school board is thoroughly informed on the advantages of proper lighting and how to get it. The architect is urged to specify correct illumination. Where differences of opinion exist, we endeavor to get the two groups together, but never do we relax in our endeavor to provide the best. Talks before civic groups, P.T.A., social service and health groups stress the fundamental relationships between light and sight, thus building up a sound background for present or future school improvements. We tune our local efforts very closely to the stream of national thought, so that even the smallest school may have the benefits of the latest findings.

Here are a few case histories that are representative. A two-room district school used approximately 4 kw.-hr. per year per pupil under the old system. For two years under adequate lighting the average has been 55 kw.-hr. per year per pupil. A remodeled city school used 29 kw.-hr. per year per pupil before new lighting was installed. The average for two years under the new lighting has been 63 kw.-hr. per year per pupil. A remodeled and added to small town school used 15 kw.-hr. per year per pupil under the old conditions and 128 kw.-hr. per year per pupil under the new. A new central school during the first year of operation used 63 kw.-hr. per year per pupil. The second year the average went up to 83. Thus, even the best represents probably less than 2½ per cent of the total cost of a pupil-year.

With every new lighting system we arrange a meeting with the teachers and have a "down to funda-

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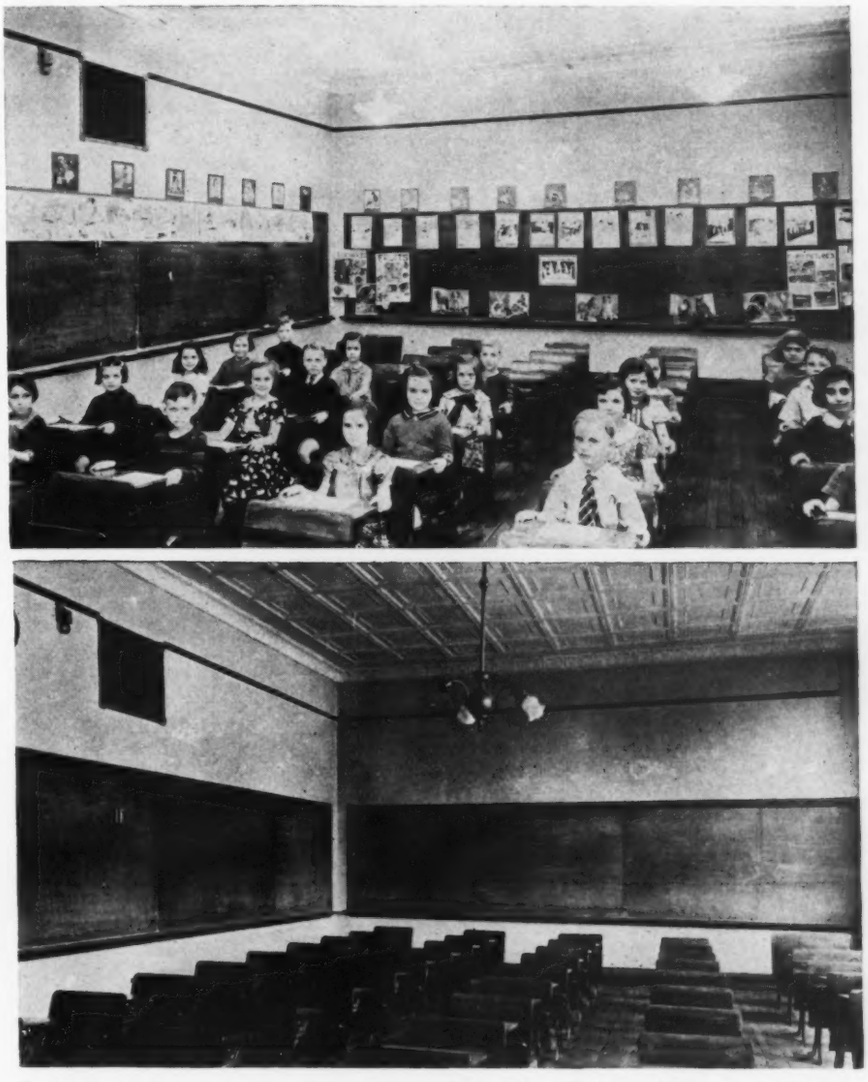


Typical of classroom transformations effected by Buffalo, Niagara & Eastern in 300 classrooms

Phase Shifter's Function in System Development

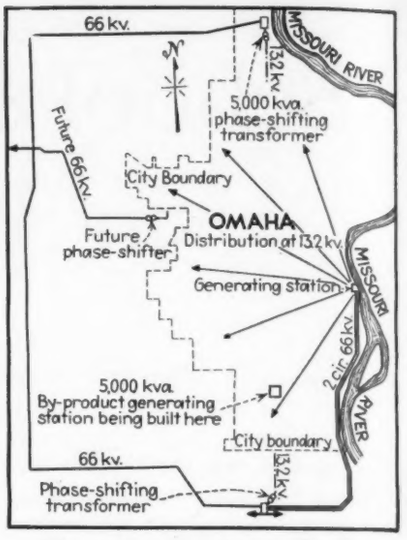
By C. S. ROODHOUSE
*Nebraska Power Company, Omaha, Neb.**

NATURAL growth of an electric power system is from a nucleus of load centered near the point of power supply—the generating station. Then, as lines are extended radially farther and farther, a time arrives when consideration must be given to ways and means for tying together the scattered ends of radial lines in order to maintain service quality, improve regulation, reduce line losses and mitigate the dangers of excessive concentrations of short-circuit current.

The commonly adopted solution to the problem is to build a high-voltage loop around the main service area, thus providing inward feed from the loop to supplement and reinforce the outward feed from the generating station. But this is a result not accomplished overnight. Rather, it is a consummation that may require several years in development, during which various expedients, or tools, must be employed to keep the system working smoothly and efficiently. Chief among the tools for this transition stage is the phase-shifting transformer; its use in almost a typical case appears on the system of the Nebraska Power Company in Omaha.

On the accompanying map the general outward flow of energy from the generating station through the 13.2-kv. city system is indicated by the radial arrows. The 66-kv. loop around the city has been in operation for a number of years, but as yet its value has not been fully capitalized because of the general conditions of business so far in these thankless '30s. But even in these depressed times the load in Omaha has continued to grow, just as it has almost everywhere else, and at certain points in the service area the support obtainable from the loop is needed. But to supply that support from a lightly loaded loop to a heavily loaded radial feeder with which it has large differences in *IR* and *IX* drops is not simply a matter of making a connection. The voltage and phase angles of the loop tap and the radial supply must be brought into agreement for the desired division of load between them. And here enters the function of the phase-shifting transformer.

* Prepared from paper to engineering conference, Missouri Valley Electric Association.



The system situation in Omaha

As appears on the map, the Nebraska Power Company has two phase-shifting installations at present and a third is contemplated.

Approximately six degrees fixed phase shift was installed on the low side of a 10,000-kva., 66 to 13.8-kv. step-down substation feeding into the South Omaha packing district, which receives most of its supply from the generating station over paralleled underground cables. Increased loads in South Omaha resulted in inadequate capacity under abnormal operating conditions and it was found desirable to provide a new 13-kv. tie feeder from the 66-kv. transmission loop. Today, eight years after the installation was made, a new generating station, to serve the packers with steam and electricity, will partially relieve the necessity for the feed into South Omaha from the 66-kv. system. These changed operating conditions may result in the future moving of this transformer and phase-shifting installation to a more useful point on the 66-kv. loop.

Impedance angles matched

Prior to last year two sources of 2,300-volt power were provided to a large pumping station at the extreme northern end of the city. A 66,000-volt substation equipped with a 5,000-kva. transformer fed directly onto the customer's 2,300-volt bus. Another 3,000-kva. transformer provided a second feed from the Omaha 13-kv. system. The impedance angles of these two paths were not exactly matched, resulting in an unequal division of load with approximately $\frac{1}{3}$ feeding over the 13-kv. route and the rest over the 66-kv. path.

The 5,000-kva. transformer was originally purchased with provision for changing the 2,300-volt secondary coils to 8,000-13,860 wye volts. In 1937 this transformer was changed for use in a connection between the 66-kv. and 13-kv. system. The substation was rebuilt, adding a 13-kv. bus.

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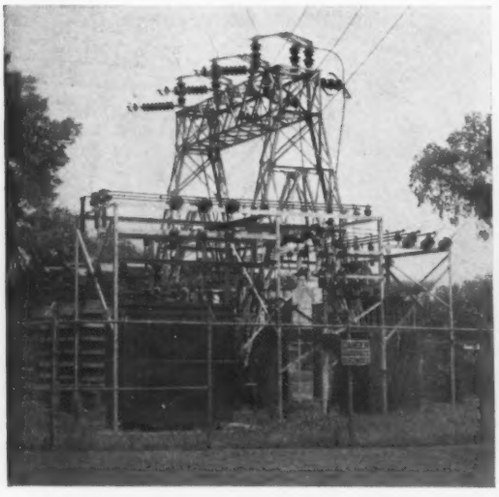

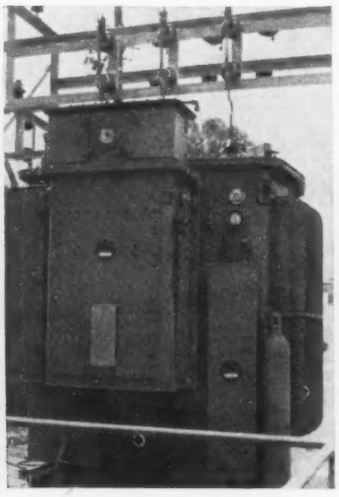

Phase shifter substation in South Omaha (left); at north end of city a 5,000-kva. unit (right)

Advanced Methods of Control Room Lighting

By W. B. MORTON *
Electrical Engineering Division, Philadelphia Electric Company

IN DESIGNING control-room lighting the main objective is to provide adequate intensity without glare. Three major problems are encountered in this type of lighting project:

First—Direct glare from light sources within the operator's field of vision.

Second—Reflected glare, or high lights on the instrument faces which obscure the scales.

Third—The chief cause of eye-strain complaint, the sharp contrast between dark surfaces such as conventional black switchboards, window shades, dadoes, etc., and the light walls and ceilings.

The chief source of glare is the direct or semi-indirect lighting unit in control rooms with low ceilings. In many cases glare has been materially reduced by lowering the direct units located behind the switchboard and relocating or shielding those directly above the boards to remove them from the operator's line of vision. In some stations the older fixtures have been replaced with totally indirect units, using lamps of higher wattage. Although in a few cases semi-indirect units were converted to indirect units by the addition of a suitable reflection plate in the bottom of the fixture, thus removing an annoying source of glare, replacement of direct units with totally indirect units of modern design seems to be the best solution to this problem for rooms with low ceilings.

Minimizing glare

Any bright source of light, whether from direct-lighting fixtures or from undiffused reflected light, will cause reflected glare or highlights in the glass instrument fronts. In aggravated cases this highlight can completely obscure the scales. Here again the best solution appears to be the totally indirect unit for low-ceilinged rooms. Some success has been obtained with elimination of highlights by use of specially constructed "non-glare" glass for instrument cases. The relatively new device "polaroid" may or may not have promise for development in eliminating highlights and is being investigated with both lighting fixture and instrument manufacturers.

The contrast between dark surfaces, such as switchboards, and the light walls and ceilings is most noticeable in control rooms with curved switchboards that "wall in" the operator's desk. Increasing general lighting intensities, in an effort to improve visibility under these conditions, sometimes accentuates the contrast, aggravating rather than improving the condition.

In an effort to determine what effect on visibility light switchboard

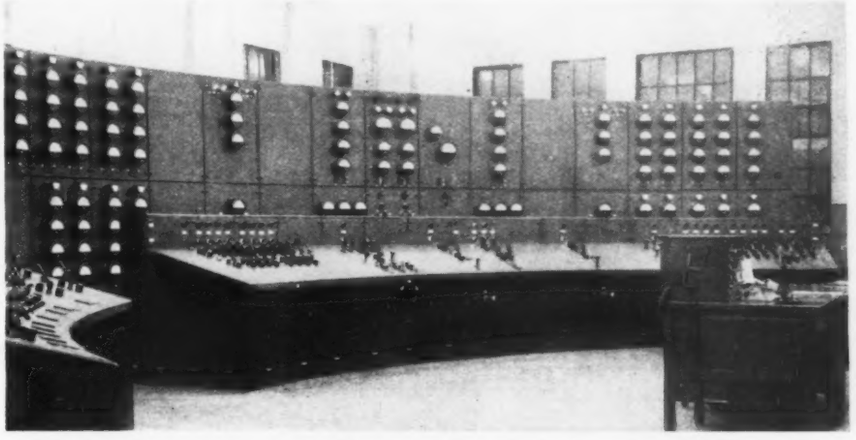

Fig. 1—Direct type units in the high-ceiling control room of Westmoreland

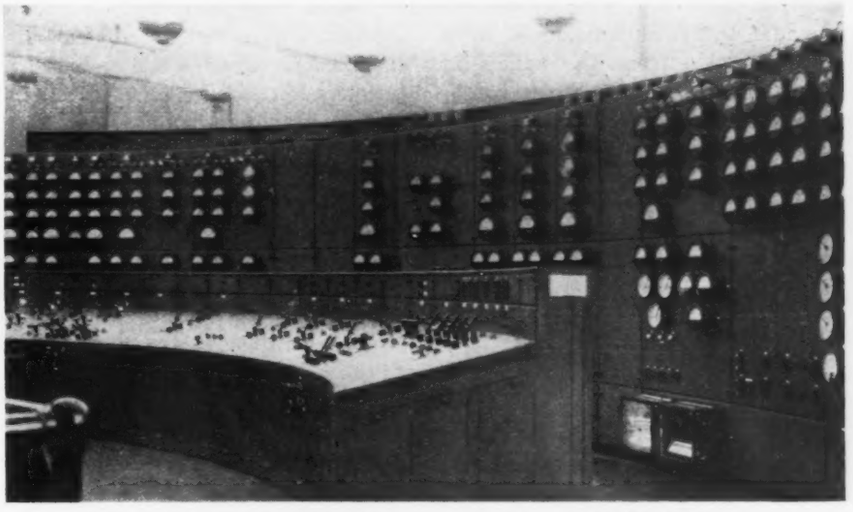

Fig. 2—Totally indirect units at Plymouth Meeting

*Adapted from paper prepared for E.E.I. committee meetings, Old Point Comfort, Va.

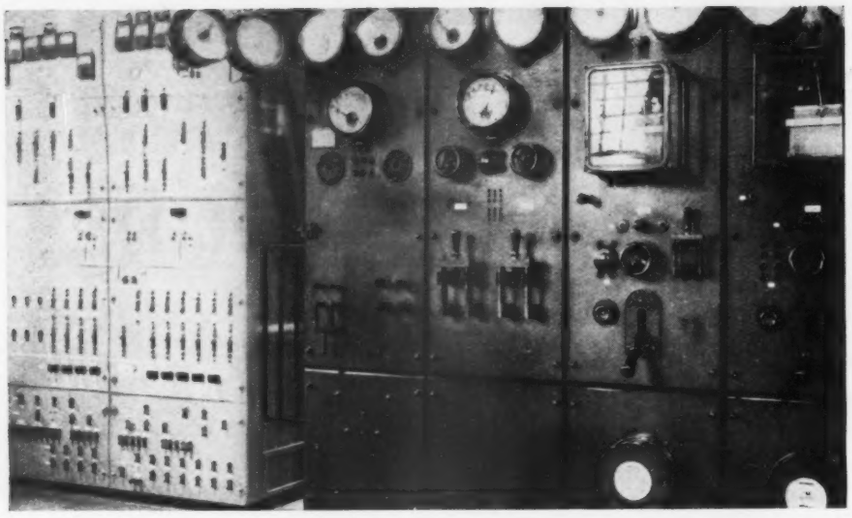

Fig. 3—Tan-colored board adjacent to conventional black board in Flat Rock hydro plant

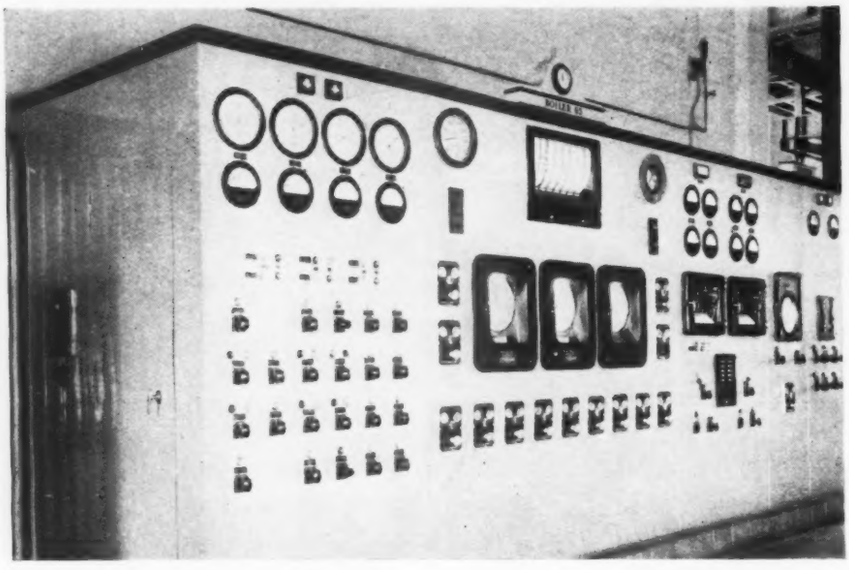

Fig. 4—Boiler control panels at Richmond, first installation of the aluminum finished boards

finishes might have, experiments were made at several Philadelphia Electric Company substations. To simulate equipment mounted on a light-colored surface the panels in one-half of a curved switchboard in each station were covered with light-colored paper, with the instruments and devices protruding through holes. The panels in the other half of the board were allowed to remain with the natural black finish. Observers of each exhibit were of the opinion that the visibility on the lighter sections of the switchboard appeared to be superior to that of the black.

Tests conducted from time to time by illumination engineers have shown that visibility of black objects (such as lettering, etc.) against a white background is materially better than that of white objects against a black background. Switchboard designers have recognized this point in recommending white-dial instruments in preference to black. In the comparison of switchboard finishes, however, it must be remembered that the observer standing before a switchboard is endeavoring to discern the black letters against the white instrument dials and not the white scales against a black or other switchboard surface. The large expanse of dark background in the black switchboard hampers adjustment of the eyes to the lettering on the scales.

The majority of Philadelphia Electric Company switchboards are constructed of black slate, the surface of which when oiled presents a black, velvety sheen. Results obtained from the paper-covering experiments indicated that this black finish was in a measure contributing to the unsatisfactory lighting conditions in certain stations. Obviously, extensive repainting of existing fully equipped switchboards would not be economically feasible. An appreciable improvement was obtained by cleaning off the original oil film with an ammonia solution, leaving the natural dark gray finish. This not only increased the visibility materially but also helped the general illumination conditions. Slate switchboards in all major substations on the system have been treated in this manner.

Lighter color chosen

The first new switchboard to be installed following the experiments in switchboard finishes was required in Flat Rock hydro station (Fig. 3) for remote control of the non-attended Manayunk substation. This appeared to be an excellent location to give the light-colored switchboard a trial, since the new board was to be adjacent to and in line with a conventional black slate switchboard. The new board is of the miniature-control type, using telephone keys for control switches. Use of miniature devices and the concentration of the control of an entire substation on two panels made it especially desirable to use a finish that would provide maximum visibility on the switchboard face.

Color selected for this board was a light buff or tan with a flat finish to minimize glare. The light color brings out the outline of the small devices in bold relief, whereas similar miniature switchboards in other stations, according to the operators, require more effort to distinguish the small devices against the black background. Operating experience with the light-colored board at Flat Rock has demonstrated the effectiveness of the light finish in improving visibility. Observers agreed that an intensity of less than 2 ft.-candles on the tan-colored switchboard produced better general visibility than that of 5 to 6 ft.-candles on the adjoining black board. Instrument dials appear to be more easily discerned against the light board. In addition, the light finish is much easier to look at steadily and tends to reduce

eyestrain. Consideration is being given to the possibility of repainting other miniature switchboards a light color.

Model studies made

In the design of switchboards for the new 165,000-kw. generator at Richmond station advantage was taken of the opportunity to obtain additional experience with light-colored switchboard surfaces (Fig. 4). In order to obtain a representative and unbiased opinion on the efficacy of a light-colored finish for the new control boards for two 600,000-lb. boilers and auxiliaries two scale models were constructed of wood to represent one of the main boiler-control boards. One model was finished in the conventional black and one in a light gray. The gray was used in preference to buff in order to match the color scheme proposed for the new addition to the boiler room. The two models, each representing in detail the finished switchboard, were exhibited side by side and inspected by representatives of various interested groups. Agreement was almost unanimous that visibility of the light-gray finish appeared to be materially superior to that of the more conventional black.

Richmond boiler-control panels represented in the models were painted a silver gray color, similar to aluminum. The aluminum finish is obtained by first Parkerizing the stretcher-level steel and applying a priming coat of overnight primer, followed by two coats of opalescent gray lacquer. This finish coat dries quickly, leaving a surface which is a soft, pleasing aluminum finish, easily cleaned with a damp cloth. Absence of gloss in this finish prevents excessive light reflection, at the same time eliminating the undesirable contrast between switchboards and surrounding walls. Radio manufacturers have used this lacquered finish extensively with satisfactory results on radio-control panels.

Brightness stimulates

Operating experience over a three-year period with this finish at Richmond station has demonstrated its advantages over other types of finish. All new switchboards required in connection with the 50,000-kw. superposed generator installation at Schuylkill station, except extensions to existing slate boards and live front switchboards for supplying 240-volt auxiliaries, are being furnished with this aluminum finish.

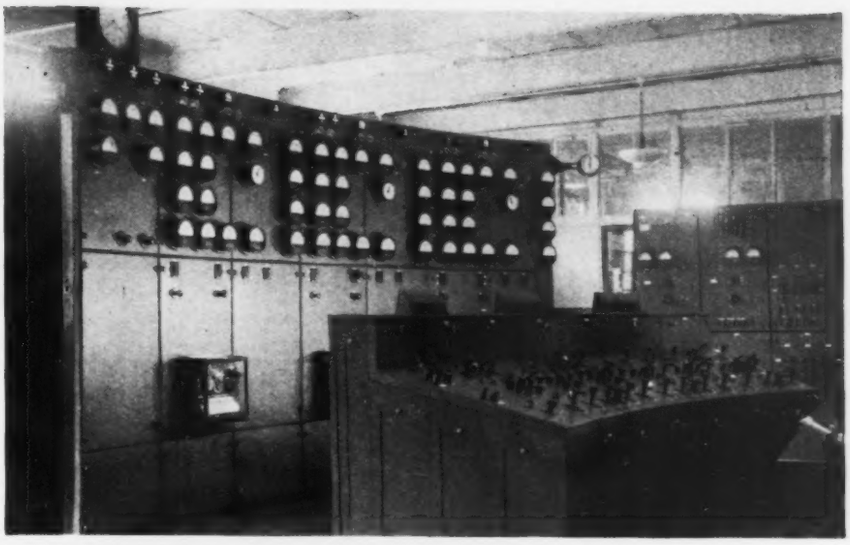

Fig. 5—Floodlighting of Lamokin substation instrument board to offset window glare

Fig. 6—Control room at Conowingo illuminated from units located between double skylight. Intensity is from 30 to 40 ft.-candles throughout the room

In addition to the tangible advantages of light finishes for switchboards, the lighter colors, psychologists agree, tend to improve efficiency of the operating personnel. Experiments by universities and industrialists have proved that lighter colors stimulate and promote efficiency, whereas darker colors tend to depress and reduce efficiency. This has been one of the leading arguments in the many lighting campaigns conducted by the electric industry. The truth of the assertion has only recently been recognized in connection with control-room lighting, but it will undoubtedly be given greater consideration by the designing engineers of future power-station developments.

Since paint, with subsequent maintenance of painted surfaces, is admittedly an undesirable feature in switchboard design, consideration has been given to the use of some form of compound or metal in natural color which does not require painting. Most compound materials with a natural finish, particularly bakelite, have an undesirable reflection created in the polishing of the surface. The polish can be removed by roughing the surface with steel wool, but, to a certain extent, this detracts from the appearance of the finished board. Stainless steel, brushed to a satin finish, appeared to have promise, although some fears were expressed that difficulties might be met in eliminating glare in the polished surface.

A two-panel switchboard required for the control of fuel preparation equipment at Richmond was selected

[*Continued on page 131*]

Editorials

S. B. WILLIAMS, Editor

Peace by Negotiation

INTIMATION was made this week in a press conference at Hyde Park by a White House spokesman that American industry could learn from the recent settlement of the war situation in Europe the lesson that it was more profitable to cease "economic saber-rattling" and to co-operate with government. The feeling was expressed that overstatements and misrepresentations had been made as to the government policies and that an over-dark picture had been painted. An illustration of such deliberate distortion was the oft-repeated statement that private utilities found it impossible to raise money publicly for new power plants.

We had hoped that there was a lesson to be learned in the method employed in Europe to establish a period of peace, but not the one which the White House spokesman's statement would seem to imply. Czechoslovakia learned that to cease saber-rattling and give in to the stronger government meant dismemberment. And that is definitely what the power industry of this country fears.

Its leaders have stated time and time again their willingness to co-operate with government, but unfortunately each time the government has asked for territory and plebiscites. Nor are these plebiscites any fairer than those which will be held in Czechoslovakia. Packed over there with Nazis, over here packed with government grants and loans.

If that is the lesson to be learned from Munich, then the power industry can and must resist. If the industry can have peace only by relinquishing to the government all that the government wants, what value is there to peace?

However, we thought we saw a different lesson arise from the Munich conference, irrespective of the details of the result. We saw nations that had been distrustful of each other, nations that had kept Europe in a state of unrest because of their unwillingness to co-operate, resolve to bring about a lasting state of peace, not by warfare but by negotiation. Strangely enough, up to recently, that had been the American way of doing things. Why can it not be invoked in the present economic crisis?

Co-operation is a two-sided affair. It doesn't mean all give on one side and all take on the other. Will government officials and spokesmen cease their attacks on utilities, their deliberate distortions, their weasel words? Will the administration, through negotiation with representative utility executives, try to arrive at a mutually acceptable national power policy that will permit the utility industry to expand normally?

The government wants, as does everybody else, a revival of business. That means primarily resumed large scale buying in the heavy goods industries. The utilities are an important purchasing factor in that market, but they cannot purchase in large volume without resorting to public financing. This financing can be done in part with bonds, but there must be a proportionate amount in stocks if the companies are to keep solvent during heavy business weather. The bonds can be sold, but the equity money is a horse of a different color. And the principal thing that makes new stock financing so unattractive to the public is the fear of government competition or sale of private properties under threat of such competition to the government at a price that leaves little or nothing for the stockholder.

The true analogy, as we see it, is not peace at any price, but peace by negotiation.

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Compensated Metering Both Economical and Reliable

RURAL ELECTRIFICATION projects in particular have given a new spurt to the spread of power supply at voltages high enough to raise the question of choice between the convenience of high-tension metering and the greater reliability and lower cost of low-tension metering. Industrial loads and utility interchanges provide other instances in the range from 22,000 to 66,000 volts. Compensated metering offers the opportunity to avoid the dilemma.

Compensated metering, which is nothing more than low-tension metering with additional meter arrangements on the low-voltage side to give automatic and proper correction for core and copper loss in the high-tension transformer, has been described in technical detail in the pages of the ELECTRICAL WORLD. It is not at all involved, yet it has not had the acceptance it deserves.

But there is an apparent confusion and a failure to differentiate between the point of metering and what is being metered. What is to be metered is a matter determined between the power supplier and the consumer and can properly be stipulated in the tariff or power contract. The point of metering and, for that matter, the entire mode of metering, are matters for determination purely by the supplier. It is a technical matter that can best be handled by a minimum of prescription, the only requirement being that the result be commercially accurate.

If these points are kept in mind and if rate sched-

ules are so drawn and power supply discussions so held as to keep the proper line of demarcation between these two important phases of the metering question, it will be found that there will be no difficulty in applying compensated metering. This will make it possible to keep high-tension metering both economical and reliable as well as safer to administer.

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Lessons from the Hurricane and Flood

SOME LESSONS have already been learned out of the experience of the New England and Long Island utilities which were hit by the hurricane, flood and tidal wave of September 21. Foremost is the need for a thorough analysis of the communication situation. Private lines, leased lines and carrier all, in one place or another, failed. As a last resort there was the American Radio Relay League, the members of which got a great kick out of staying up all hours to pass the operating and emergency messages of the utilities along with those of the relief agencies. While these radio amateurs did yeoman service, they are, after all, independent agencies. This emergency should give the utilities further justification for asking the Federal Communications Commission for a band of wave lengths with wider permission than mere emergency licensing—even seeking the support of the Federal Power Commission if that be necessary.

With but one exception there was no interruption of power generation at major plants. In fact, it is reported that one station kept generating for 30 hours waiting for a load after the lines had kicked out, the operator hesitating to violate the rule of line operation —"three times out, stay out." This incident, if correct, further proves the essentiality of communication at all times.

A second lesson can be learned in the matter of equipment sufficiency, which in some quarters was admitted to have been the bottleneck. One answer to the equipment shortage seems to be less hastiness in disposing of superseded trucks. There is justification for keeping a few more of them in the yards and on the books, just as there is for continuing certain older power plant capacity as emergency reserve. One utility crew was startled when a good Samaritan crew from a distant utility rolled in on a truck that had passed through two other hands since it had been turned in several years before by that same New England utility. It is easy to land crews from other utilities by air if necessary, but the trucks have to move over impeded highways.

As to supplies, the situation seems to have been met exceedingly well. Utilities calling that fateful night were able to reach some one on a manufacturer's staff who could get action after working hours. The desperately needed shipments were on the way in an amazingly short time.

A third lesson has to do with circuit arrangements. The affected utilities made notable efforts to restore service to hospitals, especially in Providence, where so many were injured as well as drowned. But the rest of the circuit had first to be cleared before it could be safe to re-establish service. Conceivably, the obligation to maintain or restore service to hospitals, warehouses refrigerating perishable food supplies, traffic lights and signal systems, institutions that do, or may have to, house large numbers under restraint or care may justify provision of means whereby such circuits can readily be cleared of defective portions so as to expedite restoration to "first" customers.

Power companies elsewhere can take comfort in the splendid way in which employees, consumers, government agencies, Boy Scouts, WPA, CCC co-operated with the New England utilities, but to be even better prepared they will do well to profit by the lessons that emerge from the havoc wrought by the wind and water of the 1938 equinoctial.

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Interconnection Is What You Make It

INTERCONNECTION is admittedly a very difficult engineering-economic problem. But still we wonder why more has not been accomplished in filling the recognized gaps in the interconnection picture. A discussion of this question with one utility executive throws thereon, we believe, a rather clear light. He recounted a conversation with another executive regarding a possible connection between their systems in which the first question asked was: "Can you sell me power, and how much will this power cost me?"

That attitude explains to a great extent the deferred progress of interconnections in that it shows an improper approach toward the whole idea of interconnection. The basic idea of interconnection is much more than the mere tying together of two ends of separate systems by a switch or transformer. More important is the determination to stay together through both normal and abnormal or emergency periods. Only such a spirit can accomplish and bring to fruition the major economies and benefits of operating reserves, the closer co-ordination of staggered expansion programs and the operation for best economy. In short, the establishment of all missing ties that could give to separately owned systems all, or substantially all, the benefits of integrated properties operating under a single management would seem to be a most desirable move to parallel the necessary program of adding capacity to existing stations or building wholly new ones. The industry is going to need additional capacity. Interconnection is one way of acquiring marginal requirements.

A Sudeten Peace

By CARTER FIELD

The background to Washington news being always much more exciting and frequently more informative than the news itself, Mr. Field's long journalistic experience makes his personal interpretations not only interesting but authoritative.

THERE is a possibility—not a probability—that there may be peace between the Administration and the electric industry. It is based on a number of factors, but the only brand new one is a change in attitude of certain important figures inside the New Deal.

The big question mark, of course, is: Can they persuade the President that it is to the country's interest, and to the New Deal's interest, for the government to take over all the "Sudeten" areas and then guarantee that there will be no more territorial demands?

The comparison is not precise. By Sudeten areas in this case is meant those areas into which the government-backed public ownership units have already penetrated—in which there is now or is about to be competition between public and private ownership.

Peace is in the mouths of such men as Chairman Douglas of the SEC and Basil Manly of the Federal Power Commission. War is in the mouths of George Norris, John Rankin, *et al.* The President still inclines to war. He is a good hater, and has never forgiven certain utility people who bitterly opposed—so ineffectually—his nomination in 1932. All of which dates back, of course, to the action of his Public Service Commission, when he was governor, in the Rochester case.

Peace seen possibility

But to show the frame of mind in Washington at the moment, it is being seriously said in certain quarters that if the President can force just one of the big holding companies all the way to surrender, he will be willing to negotiate a real peace, not just an armed truce.

Motives involved here cover a wide range. They run from economics to politics, with various gradations. The President has learned that cleaning up the holding company situation is not the quick putsch he had thought. At the SEC they admit frankly that it will take from five to ten years. Anything else, it is contended, might do so much harm to investors, to reviving business, that it might easily inflame the whole country—as its consequences became clear—against the New Deal's electric policy.

The importance of all this is that it is not a conservative view injected *into* the Administration. It has developed *inside* the SEC among men who were, and on all other counts still are, New Dealers.

What about Congress?

Meanwhile there is the new Congress to be considered. The President is perfectly aware of the changes that have come from the purge and other primaries; that there will be much more independence; that men attacked as tools of the power trust by New Deal opponents did not seem to be hurt.

So, in making a peace, he just might not be surrendering as much as might appear on the surface. For example, there is little doubt that the Glass-Byrd-Tydings-Bailey-Adams group in the Senate, always worried about the mounting federal debt, could get further next session than last in clipping the claws of Harold Ickes. Feeling between the PWA head and the conservative senators has heightened considerable since Congress adjourned.

In the last Congress, before there was any thought of peace, it will be recalled, there was such a strong movement against government loans for competing electric systems that the Administration used the device, to head it off, of having Senator Barkley, Democratic leader, promise there would be no loans for such purposes unless a "reasonable" offer had been refused.

Just recently the Bituminous Coal Commission intervened to fight a loan by the RFC which would have financed a gas pipe line from Kansas, in the so-called Midcontinent field, up to the iron ore country in northern Minnesota. Actually the purpose of the folks who wanted the gas was to enable them to market a lower grade iron ore. They thought they could effect a very real economy by using natural gas in their processes instead of coal, the freight rate on which is around $5.50 a ton from the West Virginia mines producing the type of coal at present desired. Probability seems to be that RFC will not make the loan, and would not have made it even had the Coal Commission not intervened.

But the interesting point here is *why* the Coal Commission went to bat. Its avowed interest is not that there is anything wrong about the government financing a project which would provide a great deal of work for the men constructing the pipe line, or the men in the steel mills fabricating the pipe. What it objects to is that the pipe line, once constructed, would, by conveying a cheaper fuel to the iron range, throw a lot of miners out of work, miners who had been digging the coal which now is used in the iron range.

Coal and water power

The case seems to be on all fours with the construction of any hydro-electric plant, with such differences as may exist rather inclining to make the hydro-electric plant a more serious and lasting menace to miners than the gas pipe line. Some day the supply of natural gas, which already is piped as far as Minneapolis, just may be exhausted. But no one contends that a hydro-electric plant, once built, will ever stop producing electricity. Certainly not near enough in the future for any one now living to worry about.

John L. Lewis, head of the United Mine Workers, back in the days before there was a CIO, but when the New Deal was manifesting lots of interest in water power, made as devastating an attack on this policy as

[*Continued on page* 130]

News OF THE WEEK

Superb Work of Utility Employees Displayed During Recent Storm

Loyalty and industry co-operation held factor in quickly restoring electric service in stricken areas — Line crews, trucks and materials sent from other cities—Manufacturers rush supplies in emergency

An example of public patience, employee loyalty and industry co-operation acting in concert is found in the story of the recovery of utilities from the hurricane and flood of Wednesday, September 21, which struck the Atlantic Coast along Long Island and New England. The employees took the emergency as their own, working feverishly such long hours that it was "easier to keep count of hours of sleep than hours of work," as one of them put it.

Wire and pole and transformer producers expedited night shipments, and other utilities, from as far away as Detroit, sent men by airplane, train and bus, trucks following under police escort over the partially cleared highways.

Recognize service

After a few days of such high-pressure zeal the newspapers began to carry such headlines for suburban news as "Electric Power Return Brings Joy to Residents," "Electric Lights Restored, Stores Open First Time," "Light Service Restored—Power in Main Section," "Power Restored in Parts of Town"—all a testimony to the public appreciation of the imperativeness and sense of security in electric service.

Thousands of miles of poles and lines were down and out. It needed poles, wire, men, transformers, trucks, crossarms, splices, cutouts in huge quantities. One supplier's stock of 30,000 splices (an estimated three years' supply) vanished in a few hours. It was replenished by air-express shipments, one for 15,000 units coming from Chicago. Connecticut Light & Power Company by Friday morning had a fleet of trucks bringing in 300 distribution transformers (3 to 50 kva.) and another hundred followed from a source 200 miles away. Six cars of poles were gained, framed, treated and loaded in one day at Texarkana, Tex. Within 72 hours enough to make half a trainload were on the way to Waterbury. Some were received in less than a week.

Utility barometers (the meteorological kind) began to drop ominously in the wee hours of Wednesday and after noon the descent was precipitous. Distribution superintendents knew they were in for something catastrophic, and without waiting for news from communities by then isolated began to ship men, equipment and supplies to outlying districts. C.L.&P.'s purchasing department in the early evening used radio, messenger, private wire and the Bell phone system to rouse manufacturers. Within two hours they had 20,000 pounds of No. 4 and No. 6 wire rolling from the mills. The manufacturer's driver had to chop his way eastward, but he delivered his load at Waterbury by 4 a.m. Thursday. Within four days these shipments reached a total of 210,000 pounds. The Hartford Electric Light Company had 200,000 feet in stock, but 650,000 feet more were obtained from Hastings-on-Hudson, Perth Amboy and Ansonia.

Volunteer help

Both Connecticut Light & Power and Hartford Electric Light Company accepted the volunteered help of the other utilities and line construction contractors. Detroit sent crews by plane to Newark and rail to Hartford. Others came from Akron, Philadelphia and Wilkes-Barre. Line crews and equipment were similarly drawn from outside sources by Connecticut Light & Power. The United Illuminating Company in New Haven secured crews from Consolidated Edison.

The lessons of the 1936 flood had resulted in organization of emergency measures which stood the test of the combined hurricane and flood of 1938. Centralized engineering, dispatching and purchasing met the physical needs and organized the man-power needs.

WRECKED LINES—The work of restoration of service and utility facilities is going forward in the areas where the recent storm felled pole lines and disrupted utility service. Line crews and materials were rushed from other sections

STORM DAMAGE—Utilities in New England and on Long Island found many of their lines wrecked by the recent storm, like this one of Blackstone Valley Gas & Electric in Woonsocket. Damage in the area is estimated in millions of dollars

Thereafter it was largely up to the men out working in the devasted streets.

Managements were gratified with the superb loyalty of employees in devotion to duty and zeal to restore service. They seemed to call the companies' emergency their own. There was little rash action, but plenty of cool-headed co-ordination. Departments not ordinarily taxed by inter-related routine functioning worked together at high pitch in excellent co-ordination at strange tasks. A little stream grew to be 300 feet wide at Danielson, Conn., and a line had to be restored across it. Sales Manager Buffington of Connecticut Light & Power applied his diamond training and got a baseball with string attached across on the third try. Practically everybody worked night and day until the point was reached where rest was essential to effective progress.

Express appreciation

Newspapers in Connecticut gave much news attention to the announcements of local managers about fallen wires, about the plans and progress of restoration, but just to make sure the public would understand the plight and the diligence of the utilities many executives ran advertisements covering similar phases. Samuel Ferguson told his customers on Sunday of the outside help secured, the assurance of power from the plants and thanking them for their patience and understanding co-operation. Similar appreciation was expressed to local authorities and to the Connecticut Light & Power Company for assisting in supplying power to relieve the strain involved under abnormal conditions.

The gas company gave the Hartford Electric Light Company credit for assistance which made possible uninterrupted gas supply in all but the flooded territory.

Manufacturers of all types of electrical equipment came to the assistance of the utilities by rushing emergency equipment to the storm-devasted areas. Line equipment was in urgent demand and calls were met as quickly as trucks could be loaded and rushed to the job.

Broadcast appeals

Knowing that communication lines were down, General Cable asked the radio broadcasting stations to bulletin the announcement that the corporation was in readiness to begin emergency deliveries. The radio stations also broadcast appeals from the utilities for aid in the stricken regions.

The general sales manager plowed through the storm and debris-strewn highways to New England to aid the plants in meeting the emergency calls and to direct shipments from the company plants in other sections of the country. Being without power, the company started up an emergency standby plant to keep two shifts operating to replenish depleted emergency stocks as the utilities rushed work to replace broken power lines. The Boston manager obtained a police escort to send payrolls to plants in areas where banks had been closed because of the storm.

Out on Long Island the tide rose 14 ft., where ordinarily it is 1½ feet. Houses, pole lines and trees were wrecked as the storm hit Patchogue and vicinity. Associated Gas & Electric dispatched trucks, crews and equipment from New Jersey, Staten Island and Reading, Pa. Crews worked throughout the day and night clearing lines and restoring service. Crews, trucks and equipment were sent from other parts of the system to New England to aid sister companies. Some came from New Jersey, Binghamton, N. Y., and Johnstown, Pa.

The Glenwood Landing plant of Long Island Lighting was flooded in 9 feet of water. It was the highest tide in the memory of residents. Jim Wallace, sensing the unusual situation, dived under water to unbolt the manhole doors on the condenser and open manholes in the condenser pits so that emergency pumps could be put into operation to unwater the flooded plant. A total of 39 motors, ranging from 50 to 650 hp., were drowned out and had to be shipped to New Jersey for drying. Equipment and motors which were being installed in the new 75,000-kw. unit in the plant were used on the present 75,000-kw. unit to get it back into operation.

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Radio Series Opened by General Electric

General Electric Company inaugurated another nationwide educational campaign to spread the understanding of the benefits of the science of seeing last Monday night in a nation-wide radio broadcast, the Hour of Charm.

Gerard Swope, president, stated the company's lighting program marked the 60th anniversary of the company. It is interesting, he said, that Edison Electric Light Company, later General Electric, was founded sixty years ago largely for the purpose of research on the incandescent lamp and that idea of research has been the foundation of the industry's progress in the past six decades. He declared that this year the industry celebrates the fifth anniversary of the successful Better Light-Better Sight program.

Mr. Swope stated that electricity has done a great deal, and will do more in the future, to lighten woman's tasks, particularly in the home. He dedicated the program to the women of America.

Miss Dorothy Thompson spoke on the program.

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Attacks NLRB Regulation

Consolidated Edison Company of New York, Inc., has asked the United States Supreme Court to declare unconstitutional the application of the National Labor Relations Act to local, intrastate utilities. In its brief the utility declared it was subject to regulation solely by New York State authorities.

Indiana Meeting Told Prospects of Business of Utilities Are Good

Delegates to Indiana Electric Association are given rosy outlook for increase in commercial loads—Dean Potter explains research on alloys for handling steam at higher temperatures and pressure

Intimations of not so distant availability of low-cost alloys adequate for handling steam at temperatures and pressures considerably higher than those now in use and of consequent even firmer establishment of steam in its dominant position as the most important and most economical means for the production of electricity were given by A. A. Potter, dean of engineering, Purdue University, to the nearly 500 utility people in attendance at the convention of the Indiana Electric Association, French Lick, Ind., last week.

Amplifying statements in the text of his paper, Dean Potter said it might be that within a year there would result, from research at Purdue, data on alloy requirements for temperatures as high as 1,600 deg. F., and he spoke quite hopefully of the possibility of the production of such alloys at prices to bring them into common use.

Program needs study

These developments and other problems of power production and, as well, the power policy of the nation, which is integrally associated with them, must be, asserted Dean Potter, "considered on a fact-finding basis, without prejudice or passion, and action must be taken slowly and deliberately so as not to hinder progress."

Public and employee relations aspects of the electric utility industry were pertinently and definitely discussed by two speakers. S. B. Williams, editor of ELECTRICAL WORLD, described the editorial program about to be launched by all McGraw-Hill magazines of furnishing material and data in graphic, dramatized presentation to be used toward larger and better understanding of industry by employees and the public.

As an example of interest to his audience of utility men, Mr. Williams showed a series of graphically presented items of information which will appear in this and later issues of ELECTRICAL WORLD. He stated the obvious necessity that for this material to be effective in its purpose it must be carried to employees and to the public by the utilities themselves.

Of specific reference to employee relations was the paper "Going Up by Growing Up," by Prof. Russell J. Greenly of the department of trades and industries at Purdue. Professor Greenly set forth the changes of recent years that now make the relationships between employee and employer very different from the classic conception of them and which necessitate changed attitudes on the part of both these two principal factors in production. As each grows up in understanding of the problems and of the reasonable desires of the other, he said, so will the rewards of both go up.

Prospects are bright

Commercial prospects of the electric utilities are very bright indeed, according to papers presented by M. O. Troy and R. J. Cordiner, General Electric, and by W. H. Thompson, Westinghouse. The domestic load is a great, and will be a greater, stabilizer of the utility business, said Mr. Troy as he showed how this load is growing and may be hoped, conditions becoming favorable, to reach an annual figure of 64,000,000,000 kw.-hr. before 1950.

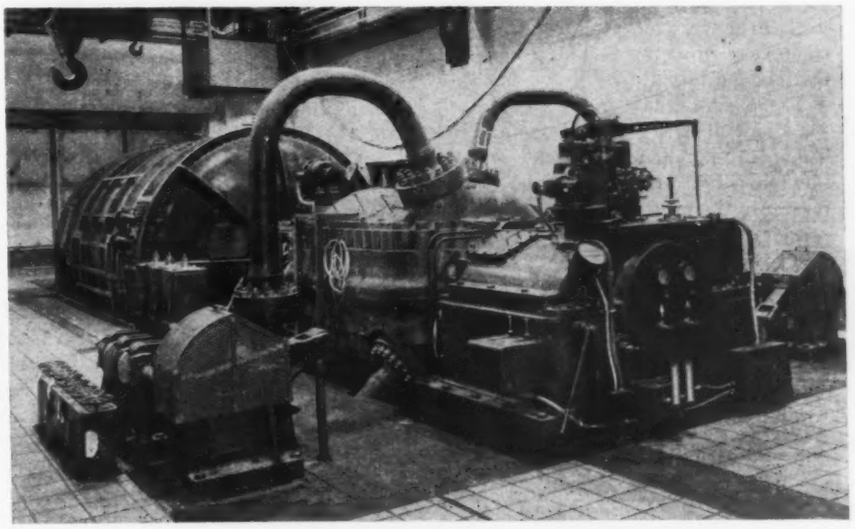
Related in interest to the optimistic pictures painted by Messrs. Troy, Cordiner and Thompson were the demonstrations of fluorescent lighting presented by Ward Harrison and the report of progress in the work of the joint industry committee for promotion of adequate wiring given to the convention by Herbert Metz, Graybar Electric. Impressive figures of cities enlisted, meetings held, plan books distributed and other evidences of awakened industry interest were recited by Mr. Metz, but he stated that adequate wiring will not mean very much until and unless the public has been educated to ask for it.

Rural co-operatives

Rural electric co-operatives are beginning to learn that they have gone into business and that they are confronted not alone by the usual problems and difficulties of development and operation, but also by special and often quite onerous conditions imposed by their close tie with government. This was the impression to be taken from the paper by Harvey B. Hartsock, attorney for the Indiana Rural Electrification Management Co-operative, an agency set up for administration of projects in the state.

B. F. Weadock, E.E.I. managing director, did not indicate great faith in the stated purposes of the national defense power committee recently appointed by President Roosevelt. He told of the questions now in the minds of many utility men as to whether or not the real purpose of the committee may not be an attempt to justify present spending for hydro power and another drive for the St. Lawrence River project on the grounds of national defense. It is felt that in war emergency there will be manifested many other insufficiencies of material and organization long before any shortage of power.

Mr. Weadock summarized the brief and exhibits by which the utilities' side of the argument will be presented to the congressional committee appointed to investigate the Tennessee Valley Authority, which evidence, to instance one point of information among the many contained in it, will show that more land has been inundated by T.V.A. dams and thus permanently removed from production than could be temporarily damaged by floods.



ESSEX GENERATOR—The new 50,000-kw. turbo-generator recently completed at Essex station of Public Service Electric & Gas Company of New Jersey, increasing capacity to 243,000 kw. Picture was taken before casing was installed

Memphis Negotiates to Purchase Electric System of Local Utility

City agrees to pay $13,500,000 for facilities of Memphis Power & Light — Price is above first offer but well under the $16,401,419 value set by utility — Customers to get 40 per cent cut in electric rates

Another operating property of National Power & Light, Electric Bond & Share System, was swept into municipal ownership when Memphis offered $13,500,000 for the electric facilities of Memphis Power & Light. A short time ago Knoxville concluded the purchase of facilities of Tennessee Public Service.

Last week the city offered $13,000,000 for the Memphis properties, which was rejected by the company after the city had rejected the company's offer of $16,401,419. A quick turn of events changed the picture before the week ended and the city raised its price to $13,500,000 for only the electric properties used for generation and distribution of electricity in Memphis and Shelby County.

Price under rate base

As the verbal agreement now stands the utility will convey to the city all the electric properties with the exception of the two transmission lines which interconnect with Mississippi Power & Light and Arkansas Power & Light, the office and service buildings, supplies and real estate. The properties to be conveyed have a rate base, as well as tax assessment, of around $3,000,000 to $4,000,000 in excess of the city's offer.

While the city's agreed price is well under what the company feels its properties are worth, the $13,500,000 is well in excess of its original offer, since less property is to be conveyed than had originally been asked.

The negotiations were closed by Mayor Watkins Overton and Major Thomas V. Allen, chairman of the Memphis light and water division, representing the city, and Paul B. Sawyer, president of National Power & Light. The drawing up of the contract is expected to take several weeks, after which it will be submitted to directors and stockholders of the two utility companies. December 1 has been set as the date for actual transfer of the properties to the city.

Memphis will halt operations in constructing a duplicate electric system and will concentrate work to connect its lines with those of the utility's. When the city begins full distribution of TVA power to all customers the TVA schedule of rates will become effective. These rates are about 40 per cent lower than rates now in effect.

Memphis Power & Light is to retain the gas properties, which have a rate base of $7,500,000, and is expected to sell the two interconnection lines to Arkansas Power & Light and Mississippi Power & Light.

The TVA will now concentrate its efforts toward arriving at acquisition agreements with Kentucky-Tennessee Light & Power and West Tennessee Power & Light, according to David E. Lilienthal.

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Court to Hear TVA Arguments on Nov. 14

Arguments before the United States Supreme Court on the constitutionality of the Tennessee Valley Authority have been postponed from October 19 to November 14, it was indicated this week by Solicitor General Jackson.

Mr. Jackson stated that the postponement was necessitated by the nomination of John Lord O'Brian, one of the government's counsel, by the Republican party as its candidate for United States Senator from New York.

"I have asked Mr. O'Brian to continue his assignment of this case," Mr. Jackson said. "He was not assigned to the argument for political consideration and would not be relieved because of political consideration." Mr. Jackson said that "we are not unappreciative of the compliment implied when the Republican convention finds its best man for this high office on the legal staff of this Administration."

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Claims Power Plan Menaces Mines and Rail Industries

Consummation of the water-power program of the federal government would ruin the coal and railroad transportation industries, along with public utilities, and plunge the nation into chaos, Carroll B. Huntress, eastern sales manager of Republic Coal & Coke Company, stated in addressing recently the New York State Retail Solid Fuel Merchants Association meeting at Lake George, N. Y.

"The principal danger we face is embodied in the scheme to blanket the nation with federal water power," he said. "The federal water-power program jeopardizes the jobs of close to 150,000 miners and railroad men," Mr. Huntress continued. "The employment of countless others is hazarded by the vicious circle of the power program. Industry would be dislocated and close to a million people added to the relief rolls. Yet the government proposes to spend more than $1,000,000,000 on a power program that would bring that about. The St. Lawrence Seaway, with its attendant water-power project, particularly threatens the coal business in New York and New England."

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Reddy Kilowatt Plans Prize Offer Contest

An industrial and commercial "customer benefits" contest is being sponsored by Reddy Kilowatt and is open to any person employed by the electric light and power industry, according to Ash Collins.

It was stated that the purpose of the contest is to mobilize the numerous advantages of central station power for the customer or prospective customer in terms of customer benefits. Papers in the contest may be of any length. There are 13 cash prizes, first of $100, second of $75, third of $25, and ten cash awards of $10 each. Papers must be submitted before December 10, in duplicate, to the Customer Benefits Contest Committee, Room 2650, 420 Lexington Avenue, New York City.

The contest will be judged by the following committee: C. A. Eastman, Ebasco Services, Inc.; J. F. Gaskill, Philadelphia Electric; A. D. McLay, Detroit Edison; W. H. Sammis, Commonwealth & Southern, and H. C. Thuerk, Utility Management Corporation.

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Earle Signs Utility Bill

Governor Earle of Pennsylvania has signed the bill giving the state Public Utility Commission authority to regulate and control mergers of all utility companies involving listed value of more than $50,000, to control issuance of utility securities and contracts between affiliated companies. The bill also confirms the state's right to assess utilities for the cost of regulation.

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Ratify Symington Contract

Stockholders of the Emerson Electric Manufacturing Company have ratified the recent action of the directors in engaging W. Stuart Symington of New York as general manager of the company.

Pay of Westinghouse Takes 47% of Income

The story of nine years and a billion and a quarter of dollars and how it has been dispersed to suppliers, employees, stockholders and others is being sent by Westinghouse Electric & Manufacturing Company to its stockholders and employees.

It is disclosed by A. W. Robertson, chairman, that of the company's total income of $1,261,313,000, employees received $589,091,000 in wages and salaries. He said an additional $15,253,000 went to employees through group insurance and payments to the employee annuity fund. Stockholders, who own the company, he said, received only $65,146,000, or 5.2 per cent.

During the nine years Westinghouse paid out for materials, supplies, fuel, transportation and other expenses a total of $491,112,000, or 38.9 per cent. Employees received 46.7 per cent of all disbursements.

Mr. Robertson pointed out that the Treasury Department reports for 1929 to 1935 that total income of all manufacturing companies in the United States had income of $330,709,960,000; that employees' salaries and wages totaled $62,743,726,000, and net earnings were $7,348,668,000.

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New Jersey Highway Lighting Program Nearing Completion

The final segment in New Jersey's state-wide illumination of White Horse Pike is now being completed. The state program, which consists of financially aiding municipalities in their improvement of street and highway lighting conditions, is making possible what is said to be the longest continuous stretch of "safety" highway lighting—about 56 miles, from Atlantic City to Camden.

Sodium luminaires developed by General Electric engineers are being used at Camden. Forty-four such units, with open-type reflectors and horizontal-burning lamps, will light the Camden airport traffic circle and the Admiral Wilson Boulevard. The major portion of the highway is lighted by incandescent luminaires with hemispherical reflectors and refractor globes.

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Offers Aid to Power Group

The electric utility industry will cooperate with the committee appointed by President Roosevelt to recommend methods for placing the nation's power facilities on a wartime basis. In a letter to Louis J. Johnson, Assistant Secretary of War and chairman of the committee, Charles W. Kellogg, president of the Edison Electric Institute, has offered the facilities of the Institute to aid the committee.

MODERN KITCHEN—This kitchen display was one of the centers of interest at the recent Orange Show at San Bernardino, Calif. The all-electric exhibit was by Southern California Edison and drew large crowds

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Morgan Suit Dismissal Asked

TVA has filed a motion in federal district court at Knoxville, Tenn., seeking dismissal of Dr. Arthur E. Morgan's suit challenging the power of President Roosevelt in removing him last March as chairman-director of TVA. The authority declared Dr. Morgan failed to state a claim upon which relief could be granted and asserted that the President acted within his rights in ousting Dr. Morgan for "contumacy."

Petition further alleged that the court was without jurisdiction and that the former chairman had no cause for action. Judge George C. Taylor is scheduled to hear arguments and receive briefs in the case early in November.

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Bars Utility Campaigning

A temporary injunction restraining the Texas Power & Light Company and the Central Power & Light Company from interfering with or campaigning against municipal elections for the issuing of bonds for constructing electric light and power distributing systems in thirteen communities in the area to be served by power plants at the dams of the Lower Colorado River Authority has been issued by Judge Raymond Gray of the District Court at Llano, Tex. These elections are to be held within the next few days. The injunction was granted on application of Attorney-General William McCraw.

All-Electric Kitchen Exhibit

A splendid exhibit of an all-electric kitchen at the recent San Bernardino, Calif., Orange Show drew wide attention. F. H. Harrigan, Pacific Coast representative of the Modern Kitchen Bureau, said that the display by Southern California Edison was one of the important centers of interest. Harry Rice, the company's merchandise manager, was well pleased with the popular interest the display produced.

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Federal Power Body Starts New Rate Series

The Federal Power Commission has started a new series of reports showing electric rates in effect in the communities in the different states. The reports are presented in the form of "typical net monthly bills" for residential, commercial and industrial service.

It was stated that an innovation in the new series is the showing of incremental charges for the use of electric energy for refrigeration, cooking and water heating. For refrigeration service 75 kw.-hr. is assumed, for cooking 150 and for water heating 250 kw.-hr. Copies of the reports may be obtained from the commission.

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Sees $1,000,000 Market

The Electrical League of Cleveland finds that in excess of $1,000,000 will be spent this fall for home laundry equipment. October 23-29 has been designated as national washer-ironer week and dealers are planning an aggressive educational and sales campaign.

Manly of FPC Tells of Power Survey

Before the members of the West Virginia Utilities Association in convention at White Sulphur Springs last week Basil Manly of the Federal Power Commission discussed the survey of power made to provide an ample supply in time of military or other emergency.

"While the commission's powers and duties with respect to interconnection and co-ordination are restricted in times of peace to the promotion of voluntary efforts in this direction," Commissioner Manly said, "in time of war or emergency involving a threatened shortage of electric energy the commission has broad mandatory authority to require the interconnection of electrical facilities and such generation, interchange or transmission of electric energy as in its judgment will best meet the emergency and serve the public interest. . . ." Mr. Manly referred to the committee recently appointed by President Roosevelt to make recommendations from a national standpoint.

Recounting co-operation with state commissions, Commissioner Manly said the most important activity had been the working out of a uniform system of accounts for utilities which had been adopted by the Public Service Commission of 24 states. He referred to the discrepancies which had existed in rate schedules. "Both publicly and privately owned utilities whose rates were thus shown to be out of line with those of surrounding similarly situated communities undertook the revision of their rates, and as a result we have today a far sounder and more equitable rate structure throughout the United States than previously existed."

•

"GoodHousekeeping" Contest in Florida

Pleased with the initial success of its "Good Housekeeping" contest, Florida Power Corporation is continuing the plan, which was started to create interest in maintaining an orderly and efficient appearance of various plants, buildings, substations, warehouses and other utility properties.

In continuing the contest plan, it is planned to award plaques and trophies every six months at specific times. Since inspections may occur at any time, the organization must keep on the alert to maintain first-class appearance of the property. The first contest, originated by the president, A. W. Higgins, ran from July to September; cash prizes were awarded to the operators of the various groups of properties who were responsible for improving the physical appearance of their plants.

The company reports that a valuable annual contract was obtained as a result of the favorable impression made on an outsider by the condition of one of the substations.

•

A.S.T.M. to Discuss Research

Under the auspices of the Philadelphia district committee of the American Society for Testing Materials, headed by N. L. Mochel, Westinghouse Electric & Manufacturing Company, and R. W. Orr, RCA Manufacturing Company, chairman and secretary, respectively, a dinner meeting will be held at the Penn Athletic Club, October 17. Dr. L. W. Chubb, since 1930 director of research for Westinghouse, will lead the discussion with an address on "Fundamental Research in Industry."

Meetings

International Association of Electrical Inspectors — Southwestern section, Hotel Lafayette, Long Beach, Calif., October 10–12. H. L. Gerber, secretary, 205 City Hall, San Francisco, Calif.

Wisconsin Utilities Association — Electric section, commercial and technical divisions, Schroeder Hotel, Milwaukee, Wis., October 24–25. A. F. Herwig, executive secretary, Brunder Bldg., Milwaukee, Wis.

Edison Electric Institute—Electrical equipment committee, Chamberlain Hotel, Old Point Comfort, Va., October 10–11; transmission and distribution committee, Chamberlain Hotel, Old Point Comfort, October 11–12, Bernard F. Weadock, managing director, 420 Lexington Avenue, New York, N. Y.

National Safety Congress — Silver Jubilee, Stevens Hotel, Chicago, Ill., October 10–14.

Electrochemical Society — Fall meeting, Hotel Seneca, Rochester, N. Y., October 12–15. Dr. Colin G. Fink, Secretary, Columbia University, New York, N. Y.

Western Society of Engineers—Joint meeting with A.S.M.E. and A.I.M.&M.E., Palmer House, Chicago, Ill., October 13–15.

American Welding Society—Annual meeting, Book-Cadillac Hotel, Detroit, Mich., October 16–21.

National Electrical Wholesalers Association—Semi-annual convention, Drake Hotel, Chicago, Ill., October 18–21. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

National Electrical Manufacturers Association — Annual meeting, Palmer House, Chicago, Ill., October 24–28. W. J. Donald, managing director, 155 East 44th St., New York N. Y.

National Association of Railroad and Utilities Commissioners—Annual meeting, New Orleans, La., November 16–18. Clyde S. Bailey, secretary, Earle Bldg., 13th and E Street, Washington, D. C.

American Institute of Electrical Engineers—Annual meeting, southern district, Miami, Fla., November 28–30. H. H. Henline, national secretary, 33 West 39th Street, New York, N. Y.

Sell 231,104 Units in Appliance Drive

The "Jobs for Men—Edison's Bargain Package for You" campaign, which started September 1, concluded its first month with sales totaling 57,776 packages, a substantial portion of the initial quota of 175,000 packages set by Vice-President E. F. Jeffe, in charge of system sales of the Consolidated Edison Company of New York, Inc., when the campaign began. The campaign closes on December 31.

A breakdown of the sales results to date indicates that packages are being sold at the rate of about 3,000 a day. Of the total sales, from which Consolidated Edison will realize no profit whatever, 22,225 were made by dealers and 35,551 by employees of the system companies.

A highly organized program is being carried out jointly in the New York metropolitan area by Consolidated Edison and General Electric Company which aims to sell a million dollars worth of vacuum cleaners. The campaign was launched on September 1. Extensive newspaper advertising, billboards, specially built displays for floor and windows, consumer broadsides, handbills and the combined display and personnel resources of General Electric, Consolidated Edison, the latter's co-operative dealers, numbering over a thousand, and three G.E. cleaner distributors in the territory, E. B. Latham & Company, Royal Eastern Electrical Supply Company and G. E. Supply Corporation—all these factors are combining to make this effort the most outstanding and concentrated merchandising drive on cleaners ever conceived. It is expected that 25,000 units will be sold by mid-November, and there is a possibility of the campaign's being extended to the end of the year.

•

Inaugurates Sales Drive

Wisconsin Michigan Power Company inaugurated a 60-day sales drive on September 28 at a meeting of about 220 employees in Appleton, Wis. Speakers at the meeting included R. E. Williams, manager of the utility's southern division; Alex O. Benz, general chairman, "Sales Mean Jobs" campaign; A. N. Aldrich, division engineer, Westinghouse Electric & Manufacturing Company; John O'Neil, Milwaukee Electric Railway & Light Company; N. Zanzig, advertising and promotion manager for the utility, and F. W. Muck, company sales manager. The sales drive will include both the southern and northern divisions.

Output Falls After Storms

Destruction in East halts upward trend — Central region hesitates — Pacific above 1937

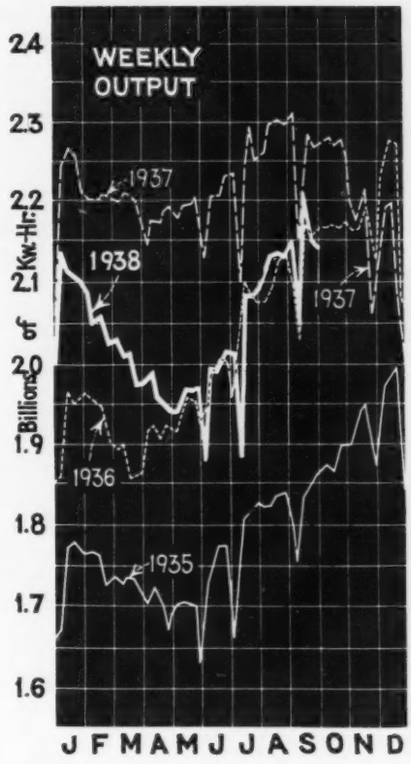
Preliminary figures for the production of energy by the electric light and power industry during the week ended October 1 indicate a slight recession from the preceding week to 2,143,230,000 kw.-hr., according to the Edison Electric Institute. This was 5.8 per cent less than in the corresponding week a year ago and 0.7 per cent under 1936.

As was the case a week ago, valid comparisons with other years cannot be made; production totals continue to reflect consequences of recent destructive storms, notably in New England. Statistics for that region are still unavailable, but estimated operations are included in the total.

Only one region, the Pacific, reports a gain over 1937. In the Middle Atlantic the output was close to that a year ago and about 3 per cent more than in 1936. In the Central Industrial region the disparity compared with 1937 widened, but it remains smaller than it was in the entire period from January to Labor Day. The severe lag in the Mountain States continues.

Weekly Output, Millions Kw.-Hr.

1938		1937		1936	
Oct. 1.	2,143*	Oct. 2.	2,276	Sept. 26.	2,157
Sept. 24.	2,147*	Sept. 25.	2,266	Sept. 19.	2,171
Sept. 17.	2,215	Sept. 18.	2,281	Sept. 12.	2,029
Sept. 10.	2,048	Sept. 11.	2,154	Sept. 5.	2,099
Sept. 3.	2,149	Sept. 4.	2,321	Aug. 29.	2,136
Aug. 27.	2,134	Aug. 28.	2,295	Aug. 22.	2,126
Aug. 20.	2,139	Aug. 21.	2,304	Aug. 15.	2,094



Per Cent Change from Previous Year

Region	Week Ending Oct. 1	Sept. 24	Sept. 17
New England	†	†	− 1.8
Middle Atlantic	− 0.5	+ 3.6	+ 1.6
Central Industrial	−10.5	− 9.6	− 8.1
West Central	− 3.3	− 4.3	− 3.0
Southern States	− 3.8	− 5.8	− 1.1
Rocky Mountain	−22.7	−18.6	−19.6
Pacific	+ 0.5	+ 1.3	− 0.1
United States	− 5.8*	− 5.3*	− 2.9

* Preliminary † Not available.

Output for August Sets High for Year

Production of electric energy for public use in the United States during August was the highest of any month to date in the current year, totaling 9,915,000,000 kw.-hr., a gain of 6.9 per cent over July and a decrease of 4 per cent from August last year, according to the Federal Power Commission. For the year ending August 31, production totaled 112,045,000,000 kw.-hr., a decrease of 4 per cent from the corresponding period last year.

The average daily production during August was 319,832,000 kw.-hr., 6.9 per cent more than the average daily production in July. The normal change from July to August is a gain of 2.5 per cent. All of the above data exclude the output of electrified railroads, electric railways and certain state and federal plants not producing energy for public use.

Electric utility power plants consumed approximately 3,490,074 net tons of coal in August, of which 3,315,400 tons were bituminous and 174,674 tons were anthracite, increases of 9.1 per cent and 8.2 per cent, respectively, when compared with the previous month. Total stock of coal on hand September 1 was 9,160,981 tons, a decrease of 1.4 per cent from August 1 and a decrease of 7.0 per cent from September 1 last year.

•

Burroughs Quits Associated

Fred S. Burroughs has resigned as vice-president and director of Associated Gas & Electric Company and will relinquish his directorships with other companies in the Associated system, he disclosed last week before a hearing of the SEC. The commission ordered the hearings to discover what relationship, if any, exists between Utilities Employees Securities Company and Associated Gas system. Mr. Burroughs will continue to serve the service companies in the system.

In addition to being vice-president and director of Associated Gas & Electric and Associated Gas & Electric Corporation, Mr. Burroughs is a vice-president and director of NY PA NJ Utilities Company, Metropolitan Edison Company and a director of Long Island Water Corporation and South Carolina Electric & Gas Company.

•

Maintains Utility Is Not Under Federal Jurisdiction

Testifying in an investigation of a transaction by which the New Jersey Power & Light Company acquired 341,350 shares of common stock of Jersey Central Power & Light Company, T. R. Crumley, president of Jersey Central, told an FPC examiner that his company was not under commission jurisdiction in so far as transmission of power is concerned.

The companies contend the commission had no jurisdiction over the transaction because Jersey Central was not engaged in interstate commerce. Mr. Crumley stated Jersey Central owned no lines extending to or beyond the borders of the state and it had no control over power sold to the Public Service Electric & Gas Corporation and the New Jersey Power & Light Company after it left Jersey Central's plants. He said the stock sale and power contracts with other companies had the approval of the New Jersey Public Utility Commission.

•

Power Plant Reconditioned

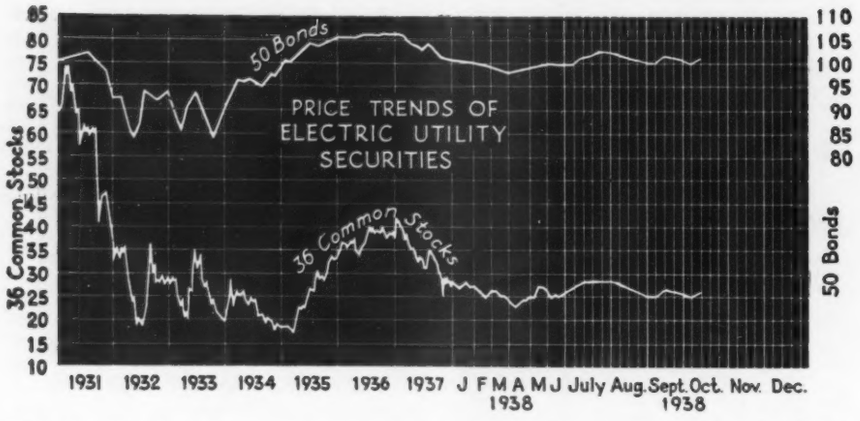
The power plant of the Pecos Valley Power & Light Company, situated 10 miles from McCamey, Tex., which was constructed in 1927 at a cost of $2,000,000, has been reconditioned and was recently again placed in operation after being shut down since January, 1933. During the intervening period the company has been purchasing power from the Texas Utilities Company and distributing it to a number of towns over its transmission lines.

•

Municipal Plant Owes Taxes

An investigation has been started by city officials at New Castle, Ind., on a report by the county treasurer that he would attempt to enforce payment of taxes owed the county by the municipal light and water plant by withholding payment to the plant for light and water used at county institutions. The county claims delinquent and current taxes from the city to be $4,261.

Stocks and Bonds Swing Upward


50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
1931 1932 1933 1934 1935 1936 1937 J F M A M J July Aug. Sept. Oct. Nov. Dec.
1938 1938

With the easing of the war nervousness last week, utility stocks and bonds shared in the convalescence of the general market, the "Electrical World" stock index climbing 2.4 points to 27.0—index a year ago, 29.3—while the bond index rose 1 point to 101.4

Utilities Plan Two Large Bond Issues

Public Service Company of Northern Illinois, principal subsidiary of Commonwealth Edison Company, has filed with the SEC a registration statement covering the proposed issuance of $80,000,000 first mortgage bonds, 3½ per cent series due 1968. Proceeds are to be used to refund the remainder of its publicly-owned funded debt with the exception of $228,000 of bonds of a predecessor company which are noncallable. This Public Service bond financing is one more step in the comprehensive program of simplifying the capital structure of the Commonwealth Edison group of companies and reducing interest charges.

In anticipation of this financing, Commonwealth Edison Company has recently advanced Public Service Company sufficient funds to provide for a reduction of approximately $30,000,000 in Public Service Company's mortgage indebtedness.

Ohio Power Company, a subsidiary of the American Gas & Electric Company, has filed an application under the Public Utility Holding Company Act for exemption from the requirement of filing a declaration in connection with the issue and sale of $55,000,000 of first-mortgage bonds due in 1968, at an interest rate not stated at this time, and the borrowing of $10,000,000 from banks against its ten-year 3½ per cent promissory note, maturing on October 1, 1948. Proceeds from the sale of the bonds and the loans would be used to purchase from the American Gas & Electric Company $15,306,000 of applicant's first and refunding mortgage gold bonds, 4½ per cent, Series D, due on June 1, 1956; to redeem $13,794,500 of applicant's first and refunding mortgage gold bonds, 5 per cent series B, due 1952; to redeem $29,355,000 of applicant's first and refunding mortgage gold bonds, 4½ per cent, Series D, due 1956; to redeem $958,500 of first mortgage, thirty-year 5 per cent gold bonds, due 1944, of Ohio Light & Power Company; to reimburse the applicant's treasury for expenditures made for permanent improvements and additions.

•

Issue 97 Per Cent Sold

Final figures on the subscriptions to Commonwealth Edison Company 20-year 3½ per cent convertible debentures indicate that 97 per cent of the debentures were taken through the exercise of subscription warrants. This compares with 96 per cent for the issue offered to stockholders in June. The 88 underwriters will, therefore, be obliged to take up only about $1,000,000 of the debentures.

•

Utilities Vote Dividends

Among the electric light and power companies which have recently declared dividends against arrears are the following:

Arkansas Power & Light Company declared against arrears a dividend of $1.75 a share on the $7 preferred stock and one of $1.50 a share on the $6 preferred stock. On July 1 similar amounts were disbursed against arrears.

A dividend of $1.75 a share was voted on the 7 per cent preferred stock of the Central Maine Power Company, which is in arrears. The same disbursement was made on July 1.

Montana-Dakota Utilities Company declared a dividend of 6 cents a share to common stockholders, or 4 cents less than the July 1 disbursement.

SEC Registrations Total $243,412,000

During August, 1938, a total of $394,433,000 of new securities became fully effective under the Securities Act of 1933. Included in this amount were $78,465,000 of stock issues that were registered for reserve against the conversion of other securities, so that the total, net of these reserved securities, was $315,968,000. This is the highest figure for any month since June, 1937.

Registrations by gas and electric utility companies accounted for more than three-fourths of the August, 1938, total and were the largest in dollar amount to have been effectively registered by this group in any month since the introduction of the Securities Act. Their registrations (exclusive of securities reserved for conversion) amounted to $243,412,000 in August.

As a consequence of the high utility registrations, 68.3 per cent of the net proceeds estimated to be received from all issues was intended for the repayment of indebtedness. About 15.8 per cent of the net funds was to be used for new money purposes.

•

Cincinnati Plan Approved

Stockholders of Cincinnati Gas & Electric Company approved proposed recapitalization plan at a special meeting. The plan, which has been approved by the SEC, provides for a write-down in stated capital represented by common shares from $30,000,000 to $7,500,000 and segregation of surplus so created in special surplus account. Reduction will be made by changing stated value of common from $40 to $10 a share without reducing number of shares.

Utilities Reports (Earnings)

	Net Income 1938	1937
*American G. & E. and subs.	$11,826,814	$13,142,277
*American Pwr. & Lt. and subs.	9,717,478	11,559,193
*National Pwr. & Lt. and subs.	8,588,233	8,461,894
*Commonwealth & Southern and subs.	12,294,364	15,820,054
*Wisconsin Pub. Serv. and sub.	1,281,786	1,500,608
*Oklahoma G. & E.	2,444,669	2,679,120
*Florida Pwr. & Lt.	2,408,943	1,696,285
*Utah Pwr. & Lt. and subs.	1,354,606	1,703,604
*Montana Pwr. and subs.	2,478,287	3,934,261
*Arkansas Pwr. & Lt.	1,171,626	1,497,793
†Electric Pwr. & Lt. and subs.	6,626,639	9,458,267
†United Gas and subs.	7,784,950	11,438,261

* Twelve months ended August 31.
† Twelve months ended July 31.

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Machine Stretches Condenser Tubes

A new technique evolved by engineers of the Staten Island Edison Company has tripled the life of condenser tubes used at the company's Livingston plant. Condenser tubes that were formerly scrapped when the erosive action of salt water reduced the wall thickness near the inlet end are now mechanically stretched and the bad ends cut off.

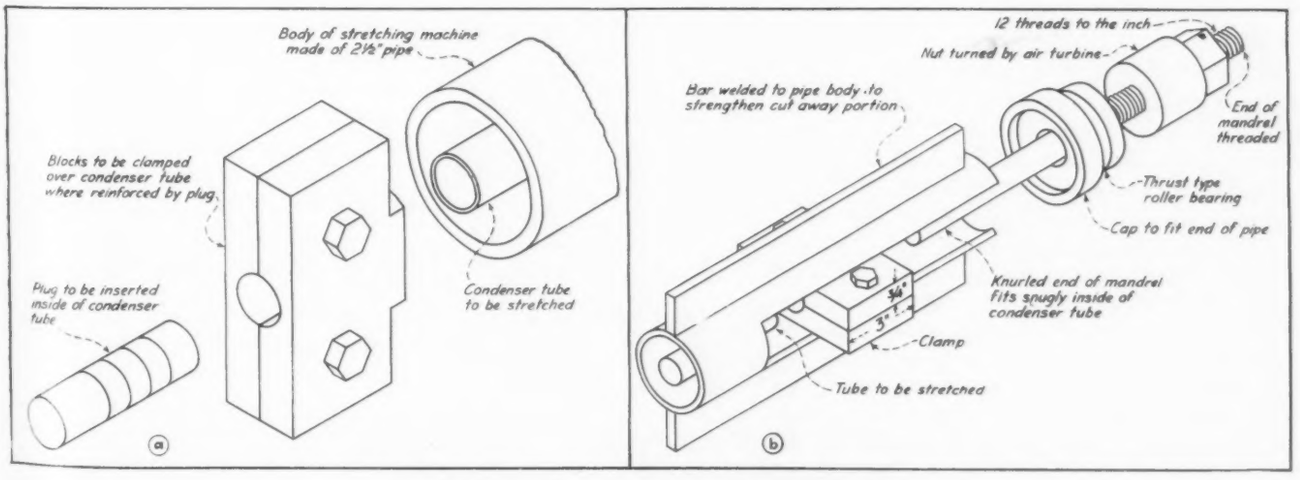
Upward of 700 tubes have been stretched in this manner and replaced in the condensers at this plant. Measurement shows that the diameter of the 1-in. brass tubes used are reduced about 5/1,000 in. in the stretching operation. Repeated mercurous nitrate tests on the stretched tubes have failed to show cracks or strains in the tubes and it is consequently believed that it will be possible to stretch the tubes twice without annealing them and at least once after each anneal. The tubes that are being stretched at the Livingston plant are 20 ft. 2¾ in. long, 1 in. in diameter, 18-gage admiralty tubes and are stretched between 6 and 7 in. at a time.

Details of mechanism

The mechanism for stretching the tubes is shown in the accompanying diagrams. The condenser tubes are inserted in a stretching machine which consists of a 2½-in. wrought-iron pipe somewhat longer than the condenser tube and provided with a means for clamping the condenser tube at one end. At the other end of the pipe a threaded mandrel is clamped to the condenser tube. A nut on the threaded portion of the mandrel bears on the wrought-iron pipe through washer and thrust bearing combination.

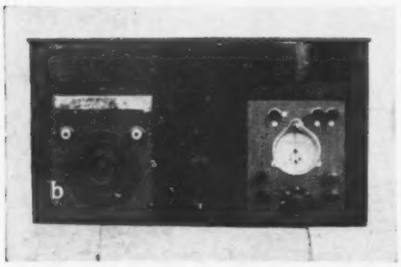
With the condenser tube clamped in the stretching machine as described the large nut on the threaded end of the mandrel at the stretching end of the machine is taken up with an air turbine. The thrust of the nut is taken by a thrust type bearing which bears on a durable metal cap, which in turn bears directly on the end of the wrought-iron pipe of the machine. When the condenser tube has been stretched the desired amount is unclamped and removed from the machine and trimmed to the desired length. About twelve condenser tubes can be stretched by two men in an hour with this machine.

When the tube stretcher was first constructed considerable difficulty was experienced with the threads stripping on the mandrel, which was made of cold rolled stock. The mandrel now used was made from a section of a Ford axle and has operated satisfactorily for some time.

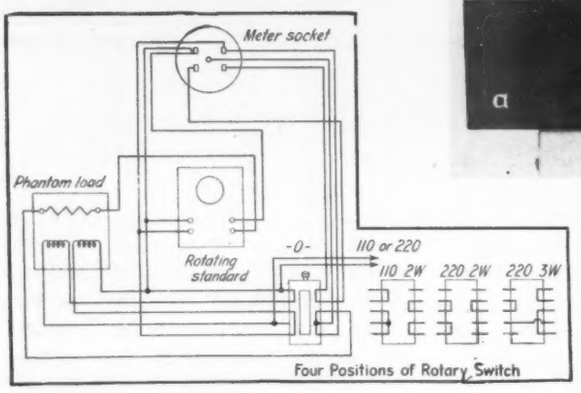

Body of stretching machine made of 2½" pipe
Blocks to be clamped over condenser tube where reinforced by plug
Plug to be inserted inside of condenser tube
Condenser tube to be stretched
a
12 threads to the inch
Nut turned by air turbine
Bar welded to pipe body to strengthen cut away portion
End of mandrel threaded
Thrust type roller bearing
Cap to fit end of pipe
Knurled end of mandrel fits snugly inside of condenser tube
Clamp
Tube to be stretched
b

Stretching machine extends condenser tube life

Condenser tubes having 3-in. section eroded at one end are stretched 6 to 7 in. in this machine, trimmed to length and restored to service. Tubes are clamped in machine at one end as in (a) and stretched as nut is taken upon threaded mandrel at the drawing end arranged as in (b).



Portable meter test set eliminates connections in testing socket meters in field



(a) Front of set showing sliding back in place for testing. It folds down to the left when not in use. (b) Top view of set with back down. Phantom load at left, drum switch barely visible in center and rotating standard at right.

Socket Meter Kit Speeds Field Tests

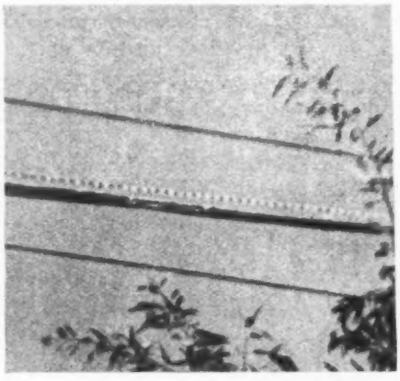
By JAMES A. DAVEY
Meter Department,
Ohio Public Service Company,
Warren, Ohio

With the gradual change to outdoor socket meters on the Warren property of the Ohio Public Service Company schemes to facilitate testing were investigated. The resulting meter test box for field testing does away with external connection, saves time and can be used by testers with a limited amount of instruction. Facilities are provided for testing 115- or 230-volt, two- or three-wire meters. Mounted in the set is a phantom load, rotating standard, drum switch and meter socket.

A conventional baseboard outlet in the front of the set allows it to be connected to the local power supply of either 115 or 230 volts. A toggle switch energizes the set. As shown in the accompanying diagram, the four-position drum type rotary switch provides the proper connection for testing the various meters. Besides the zero position this switch (1) makes connections for testing 115-volt, two-wire meters, (2) connects the phantom load coils in series for testing 230-volt, two-wire meters. (3) connects the current coils in series for testing 230-volt, three-wire meters and drops the voltage connection to its proper place at the back of the meter.

The meter socket is mounted on a panel that can be dropped down inside the test box when not in use. In this position the set can be fitted with a cover and carried about on a strap by the tester. It has been suggested than an adapter could be used to replace the socket when indoor meters are being tested. This has not been done, however.

HANG TREE WIRE ON MESSENGER



Where trees are exceptionally objectionable the Nevada California Electric Corporation has resorted to a special type of construction, in which standard tree wires are strung on messenger. About a circuit mile of this type of construction is in service. It has been used successfully on 2,300- and 4,000-volt circuits. Copperweld strand is employed as a messenger. The tree wires are hung on the messenger by means of ordinary cable rings.

Capacitors Yield Many System Benefits

By H. A. McLAUGHLIN*
Protection Engineer,
Central Hudson Gas & Electric Corporation,
Poughkeepsie, N. Y.

As part of a larger program for system power factor improvement the Central Hudson Gas & Electric Corporation some time ago began the installation of shunt capacitors amounting in the aggregate to about 5,000 kva. Justified mainly on the above basis, the capacitors were installed in fairly large three-phase units, the installation cost of which is competitive with synchronous condensers. They offer the following advantages over synchronous condensers in addition to power factor improvement:

1. Better distribution of corrective kva.
2. Increased capacity of distribution circuits.
3. Increased substation capacity.
4. Decreased losses in distribution circuits.
5. Decreased losses in corrective equipment.
6. Improved voltage levels on distribution circuits.
7. Increased capacity of production and transmission facilities.
8. Release of investment in boosters removed from circuits.

To determine the size and location of the installations circuit load records were studied and those circuits on which it appeared that a capacitor of 60 kva. or larger might be applied were checked for further study. On these circuits graphic records of kilowatts and reactive kilovolt amperes were taken to determine the character of the load.

Factors affecting location

From these records a final decision was made as to the circuits on which the capacitors were to be placed as well as their size. The location on the circuit was somewhat fixed by two factors. Being polyphase units, they were placed as near the end of the polyphase portion of the circuit as possible. This placed the capacitor in most cases at or near the load center. In cases where the circuit had polyphase branches the capacity was divided in proportion to the connected kva. where this did not involve the use of small units.

To detect the existence of harmonic currents, current readings were taken with a clip-on instrument as each unit was cut into service. However,

* Abstract of a paper presented before Empire State Gas and Electric Association.

Versatol Performite

REG. U. S. PAT. OFF.

Cable

MOISTURE resistance (0.01), heat resistance (75 C), and long life (504) — these are the three most desired properties that are all combined in Versatol Performite insulation. They are the reasons why you can expect low-cost, long-time service from cable insulated with this (G-E R-300) compound.

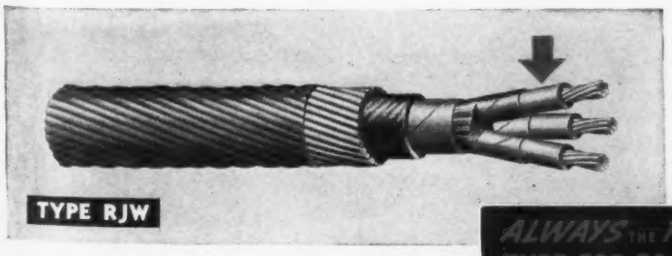
Translate these values into economic terms and you have the advantages.

0.01 *Moisture-absorption factor in gram per sq in.* This permits running the cable under water without any additional moistureproof covering. Lead sheath is unnecessary.

75 C *Maximum operating temperature.* This may allow a reduction in conductor size — with savings in space and cost.

504 *Hours in oxygen bomb at 300 lb per sq in.* This is the standard Performite accelerated aging test, which is said to approximate 50 years of natural aging. Such long life means savings in maintenance and improvements in service.

Balance these advantages against the slightly higher first cost of Versatol Performite, and you can figure that this high quality can be measured in terms of long-time economies. A G-E cable specialist will be glad to work with you to see just what these economies would be. Address nearest G-E sales office, or General Electric Company, Dept. 6—201, Schenectady, N. Y.



ALWAYS THE RIGHT TYPE FOR EACH JOB

AN EXAMPLE

Type **RJW—R,** rubber-insulated; **J,** jute; **W,** wire armor

This type is popular as nonleaded submarine cable and also as dredge-feeder or vertical-riser cable. The armor has high mechanical strength, it stands abrasion, and yet is flexible. The jute acts as a cushion for the armor which is thin covered with a protective compound.

You profit most when the insulated cable you select for each job is *always* right. To this end, make full use of G-E service and get the most for your cable dollar. Look to the *right* type for long-term economy.

GENERAL ELECTRIC

Filing No. 1200 520-127

these current readings were not conclusive, since in the one case where fuses were blown the abnormal currents occurred only at intervals due perhaps to some particular load. The trouble was overcome by moving the capacitor.

As the units were cut into service checks were also made to insure that high voltages were not obtained. Graphic voltmeters were installed at the capacitor location in time to get a 24-hour run before and after the unit was cut in. These records do not always indicate the entire effect of the capacitor due to the interaction of the regulators. Under some conditions with large size capacitors the voltage on laterals between the station and the capacitor may be lowered, due to the effect of the capacitor on the regulator. In some cases regulator settings had to be changed and in a number of instances it was possible to remove fixed boosters, with a saving in losses.

In addition to the economic advantages the capacitor has other advantages, as follows:

(a) Produces a gradual voltage rise, benefiting a larger part of the circuit.
(b) Does not place equipment with limited current capacity in series in the line.
(c) Does not add to the inductive reactance of the circuit.

To summarize our experience to date the following points can be mentioned:

1. A noticeable improvement in system power factor has resulted.
2. Reduction in substation and line kva. loading has resulted, which in one case at least enabled the substation to go through last year's peak period without transformer changes which would have been necessary without the capacitors.
3. Voltage levels have been improved on many circuits.
4. System losses have been reduced, although no exact figure can be given due to changing loads and conditions.
5. Very little trouble has been experienced either due to harmonics or equipment trouble.

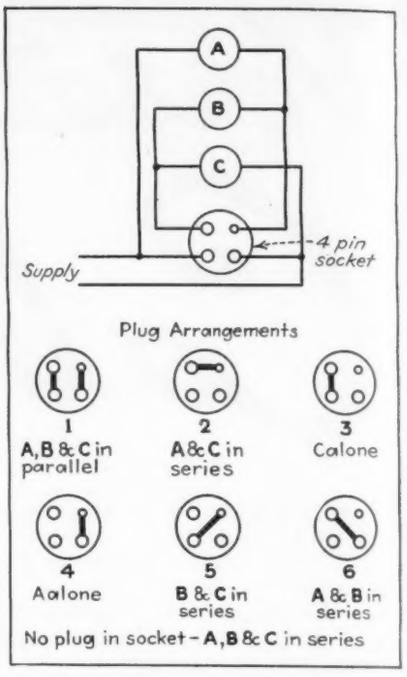
•

Test Kit Yields Range of Currents

By G. W. STUBBINGS
Stoney Lane, Winchester, England

By connecting a bank of three different lamps or resistances to the terminals of a four-pin plug socket, as shown, a convenient form of field test kit is obtained from which seven different values of resistance may be obtained with the aid of six variously short-circuited plugs which interconnect the resistance components in various ways.

If a constant voltage is applied to the terminals of this resistance box and the proper plugs inserted in the socket, predetermined values of current can be obtained for test purposes without the necessity of using an ammeter.

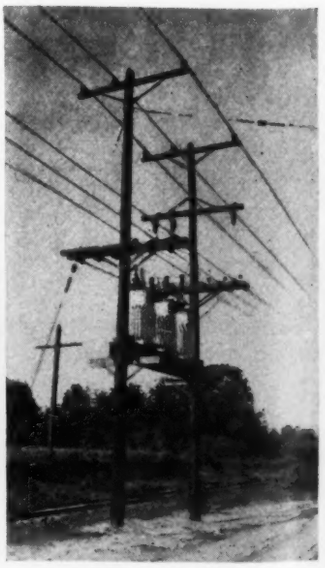


Plug-and-socket arrangement gives seven test current values with constant voltage applied to three different resistances

For convenience in use each plug may be marked on the face of its cover with the current to which it corresponds. The current for the three-in-series combination can be marked on the upper face of the plug socket. Plugs used should have one pin smaller than the others to insure proper registration.

DISTRIBUTION BANK ALOFT OR ON GROUND

Virginia Electric & Power Co.



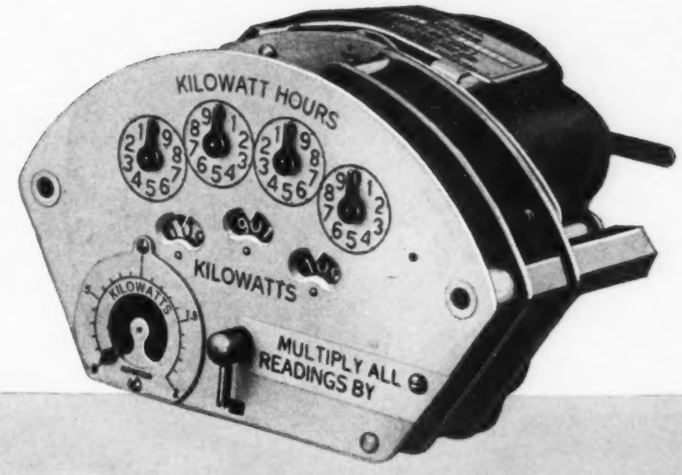
Left—150-kva., 13.2 to 2.3-kv., rural type distribution substation, including 2,300-volt induction feeder regulators on platform. Pole mounting eliminated purchase of property.

Center—1,500-kva., 13.2 to 2.3-kv. distribution substation. Transformers with cable connections, feeder O.C.B. metal-inclosed, cable connections for regulators are among notable features. Elimination of steel structure to support buses and switching equipment permits pleasing arrangement.

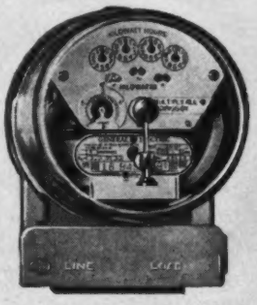
Right—13.2 to 2.3-kv. rural type distribution substation, pole mounted.

TAKE FULL ADVANTAGE OF DEMAND METERING

With this G-E Cumulative Register



It combines the verifying features of a recording device with the low cost of an indicating register



Type IM-30
The I-30 watthour meter with the M-21 demand register

IT'S A HIGH-TORQUE LOW-SPEED METER

These characteristics of G-E meters result in long-time accuracy on widely varying loads.

THIS G-E Type M-21 register does a thoroughly complete job of demand metering. Not quite the job of a recording device, but enough to give it advantages that warrant consideration on the basis of economy. See what they are and how they profit you.

How the M-21 verifies

The M-21 preserves the last reading, so that at any time during the ensuing month it is available for verification. It also adds, cumulatively, the monthly maximum demands. It thus puts the work of reading and recording data on the same basis as regular kilowatt-hours.

What you have is proof—definite evidence—by means of which you can show a customer just what is his maximum demand of the month. This is added help in building—and maintaining—good will. You are *sure.*

Savings in other ways

First cost is low; and you also save on installation. The M-21 goes right on a meter in service, which needs simply a deeper cover, and requires no extra wiring. It saves time and space; and you have a *single* tamper-proof unit. Maintenance costs little; testing is simple and sure—and you can always trust the M-21 for accuracy.

When you look into this register, study its fine performance record, and get figures on its low cost; then you can see how it enables you more fully to take advantage of demand metering. A G-E meter specialist will be glad to help. Call or write nearest G-E sales office, or General Electric Company, Dept. 6-201, Schenectady, N. Y.

GENERAL ELECTRIC

410-48

Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Cost of Operating Induction Furnaces

By F. E. BASH
Manager Technical Department, Driver-Harris Company, Harrison, N. J.

Large electrical induction furnaces in the Driver-Harris Company plant at Harrison, N. J., are proving a major factor in meeting the degree of uniformity and close composition tolerances demanded of the special alloy wire from which electron tube filaments are drawn. The exceedingly precise and special requirements of materials used by certain portions of the electrical trade call for precision melting and production methods which dictated the selection of induction melting equipment by the above. This necessitates many precautions and specially developed techniques not required in ordinary melting programs, carrying with it in some cases a more costly routine than otherwise might be expected.

Use of induction melting provides the means for maintaining the accurate control of alloy analysis necessary, while selection of large furnace units, capable of producing 1,500 lb. or more at a single melt, insure tube manufacturers of enough alloy of given characteristics for a production in some cases of a number of years.

The accompanying table details the cost of operating the two installations of two induction furnaces each used in this plant. The larger of the two pairs of furnaces consists of a 1,500-lb. and a 1,000-lb. unit, while the smaller pair consists of two 600-lb. units. All four furnaces were made by the Ajax Electrothermic Corporation and operate at a nominal frequency of 1,000 cycles, with energy supplied from special motor-generator sets. A 350-kw. generator supplies the larger furnaces and a 160-kw. generator supplies the smaller. Only one furnace of each pair is operated at a time. While one unit is melting a charge, the second unit is being cleaned and charged in preparation for the next alloy to be melted.

Prior to the installation of the present furnaces this company has used various types of electric melting furnaces, both arc and ring-type induction. The present induction units, which are used for cast and wrought products, operate at a temperature of 2,850 to 3,000 deg. F. and offer the following advantages:

1. Can be poured clean—no residue.
2. Accurate control of analysis.
3. Easier to charge, reducing direct labor costs.
4. Have lower maintenance costs.

Increase lining life

It is interesting to note that the average furnace lining life given in the table as 250 heats was secured by a change from a crucible type lining, which gave an average life of approximately 40 heats to a magnesia-alumina rammed-type lining, which in some instances has given a life of 400 heats.

The energy consumption figures and production cost data given in the table may appear high to the experienced organizations doing routine melting. The development in the electronic tube and other electrical fields using particular nickel alloys has carried with it increasing demands on the materials for precision, uniformity and special properties. This has imposed a purely technical problem of incorporating these properties into the metals required and produced the problem of performing laboratory melting on a tonnage basis. In the realization of this desiderata the production costs of melting on a tonnage basis are above the melting costs which might be expected in purely commercial production fields.

Operating Costs of High-Frequency Furnaces

General Data			
Generator rating, kw	350	350	160
Rated furnace capacity, lb	1,500	1,000	600
Heats per day (24 hours)	*13	†16	‡19
Tons per day	7.8	8	5.7
Net pound per heat	1,200	1,000	600
Energy consumption per ton, kw.-hr.	750–850	750–850	750–850
Cost of furnace lining, dollars	$130.20	$105	$70
Labor, man-hours per 24 hours	48	48	36
Fixed Charges			
First cost, including royalties and installation	$55,000	$55,000	$33,000
Depreciation — 10-year life	$5,500	$5,500	$3,300
Av. interest at 6 per cent	1,650	1,650	990
General repair and maintenance	600	500	400
Annual total	$7,750	$7,650	$4,690
Furnace Operating Cost	Per Net Ton	Per Net Ton	Per Net Ton
Fixed charges prorated (240 days per year)	$4.15	$4.00	$3.40
Refractories (250-heat life)	0.87	0.84	0.93
Power cost at $0.01 per kw.-hr	7.50– 8.50	7.50– 8.50	7.50– 8.50
Cooling water	0.53	0.51	0.36
Total (less labor)	$13.05–14.05	$12.85–13.85	$12.19–13.19

* One-hour, 50-minute cycle. † One-hour, 30-minute cycle. ‡ One-hour, 15-minute cycle.

*** GUARANTEED COPPER THICKNESS**

"The minimum thickness of copper shall be not less than 12½% of the wire radius for 40% conductivity wire, and 10% of the wire radius for 30% conductivity wire."

*** THE LIFE OF SOLID COPPER**

"The thickness and continuity of the copper covering will be such that the material will have a life, insofar as corrosion is concerned, similar to that of an all-copper wire of the same size, used under similar exposure conditions."

** Quoted from Copperweld's Specifications and Guarantee.*

. . . AND COPPERWELD'S LONGER LIFE COSTS SURPRISINGLY LITTLE

In most cases Copperweld's use adds only about 3% to the first cost of a complete guy. With three-wire Copperweld guy strand—served at the pole and on each side of the strain insulator—the cost of three guy clamps is saved. This saving may exceed the slight additional cost of Copperweld strand; and the first cost of a Copperweld three-wire guy may prove actually to be lower. Copperweld may be safely served around its own diameter. The THICK layer of pure ductile copper is permanently molten welded to the tough steel core and will not crack, flake, or peel.

COPPERWELD STEEL COMPANY

Glassport, Pa.

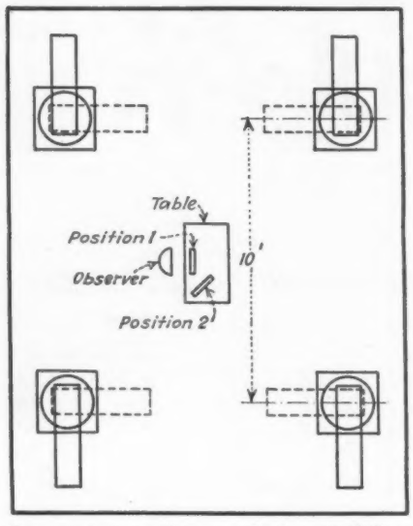
COPPER · BRONZE · COPPERWELD RODS, WIRE, AND STRAND

Revealing Quality of Lighting Measured

By H. M. SHARP—C. L. CROUCH *
Lighting Bureau, Buffalo, Niagara & Eastern Power Corp., Buffalo, N. Y.

Studies undertaken by the authors in an attempt to evaluate the relative effectiveness of general lighting systems in common use today revealed, among other things, that all systems fall short of properly revealing detail.

Reasons why general lighting systems in vogue today will not accomplish the desired purpose in producing adequate revealing quality of illumination are that many of the values of brightness in the highlights on the work are too great for comfort and the width occupies so little of the surface that it would be impossible to carry on all of the work in the highlight. If the design of the lighting system would be such as to spread a comfortable highlight over all of the material, then conditions would be ideal.



Set-up for studying relative visibility
Dotted lines represent alternate positions of low-pressure mercury-vapor units.

To determine the degree to which modern general lighting systems approach this ideal a test bay was established with four outlets on 10-ft. centers, mounted so that light centers would be 10 ft. above the floor. Nine different lighting systems were established. It being generally agreed that measurements involve the most severe visual task, a 9-in. steel scale with $\frac{1}{32}$-in. divisions and a 9-in. vernier caliper with 1/1,000-in. divisions were therefore selected for the test objects. The test object was placed flat on a table in two positions as shown in the diagram and viewed under the horizontal illumination of the four units. Height of the table was 39 in., average bench height. Visibility, brightness and illumination meters were used in making the necessary readings.

Conditions shown in position 1 are rarely countenanced because of difficulty in seeing. The workman must move his scale about until some highlight is encountered, as in position 2, and to include as much highlight as possible. To evaluate this composite condition a term "weighted relative visibility" has been coined. Considering the length of the scale and calipers as unity, the percentage of length occupied by the highlight times its relative visibility plus the remaining percentage times its relative visibility gives the so-called weighted relative visibility for the whole subject.

As stated, the ideal arrangement would be that in which the whole scale was uniformly highlighted no matter what the length. This points to indirect lighting, an artificial skylight, hood or canopy over the entire area. Anything less is a compromise between a number of factors. Relative results of such a compromise are shown in the table.

Values of weighted relative visibility as given in the table provide constructive comparisons of various lighting units. Although each falls short of the ideal, in a number of instances highlights were discovered that fulfill the requirements except as to area. A composite of these highlights expanded to cover the entire scale was taken as the theoretical ideal providing a weighted relative visibility of 7 and 4.62 respectively.

Revealing Quality of Light

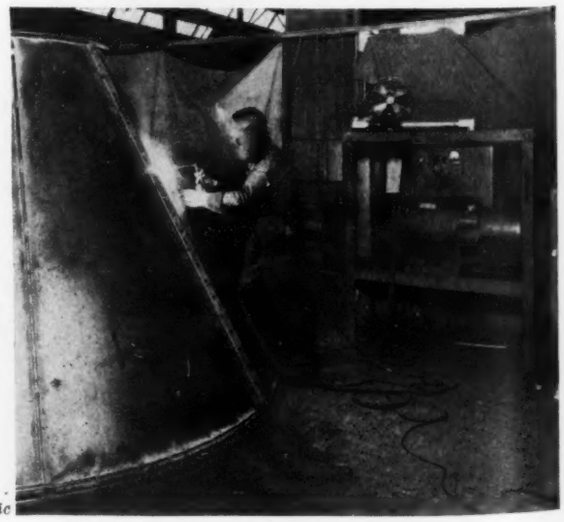
Lighting System	Relative Visibility Position 1	Horizontal Illumination	Weighted Relative Visibility Position 2	Horizontal Illumination
18-in RLM dome 500-w. clear lamp	*1.91 †1.00	42 42	2.869 2.298	38 38
18-in. RLM dome 500-w. W. B. lamp	*2.10 †1.10	40 40	3.411 2.454	35 35
20-in. Glassteel diffuser 500-w. clear lamp	*1.95 †1.02	35 35	4.35 2.88	31 31
20-in. Silver bowl diffuser — 500-w. lamp	*1.50 †1.16	33 33	4.013 3.001	29 29
28-in. Square canopy 500-w. silver bowl lamp	*2.03 †1.22	32 32	5.49 3.35	30 30
High-intensity mercury glassteel type 400-w. lamp	*1.23 †1.31	46 46	4.65 2.90	43 43
Hign-intensity mercury RLM type 400-w. lamp	*1.83 †1.28	43 43	3.29 2.44	42 42
Low-pressure mercury open trough — 36-in. tube lengthwise	*2.04 †1.23	15 15	4.21 2.76	13 13
Low-pressure mercury open trough — 36-in. tube plus 4 150-w. lamps lengthwise	*2.05 †1.64	41 41	4.16 2.75	36 36
Low-pressure mercury trough with diffusing glass — 36-in. tube plus 4 150-w. lamps lengthwise	*2.02 †1.10	29 29	4.44 3.04	25 25
Low-pressure mercury trough with diffusing glass — 36-in. tube plus 4 150-w. lamps crosswise	*2.29 †1.33	40 40	6.282 3.861	40 40
Typical good lighting	*7.00	40	7.00	40
Laboratory set-up	†4.62	40	4.62	40

* Subject — 9-in. scale 1/32 in. div.
† Subject — 8-in. scale 1/1000 in. div.

* Abstract Part I of paper "Influence of General Lighting on Machine Shop Tasks," presented by authors before convention of I.E.S., Minneapolis, Minn., August 29-31.

WELDING CUTS SHOP COSTS 30 TO 60%

Operator fabricating cone of cyclone collector using one of the four single-operator arc-welding equipments at the Raymond Brothers Division of Combustion Engineering Company, Chicago. Note the convenient bin back of the operator for holding different types and sizes of welding rod. This company reports a saving of 30 to 60 per cent in shop costs with welding over riveting in construction of pulverizing and dust-collecting systems. Riveting was slow, expensive and entailed more complex design.



General Electric

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When you specify Allis-Chalmers Distribution Transformers you get transformers that fit into your operating practice and are readily adaptable to changing service at load conditions. They give you better service at lower costs because into them is built Allis-Chalmers specialized transformer engineering and decades of service experience plus proven excellence of manufacture. • Allis-Chalmers research developed surge-protected design, solderless connectors and stud bushings, bushing coordination, and many other important features of distribution transformers that have since been accepted by the industry as general practice. • Well-informed engineers always specify Allis-Chalmers Distribution Transformers for their lines because they know that these transformers offer the utmost in distribution transformer value. You, too, can make your service more efficient and at the same time lower your maintenance costs — specify Allis-Chalmers Distribution Transformers.

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New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

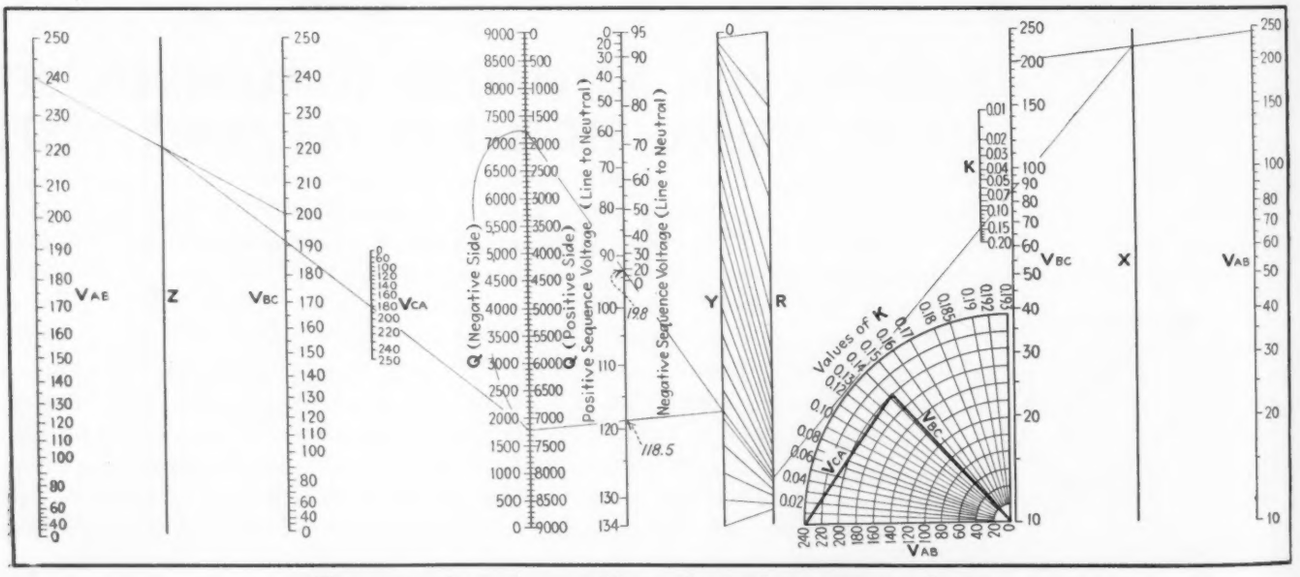
GivesSequenceValues of Unbalanced Lines

By **BERTRAM E. ELLSWORTH**
Electrical Engineer
Iowa-Nebraska Light & Power Company,
Lincoln, Neb.

When electrical systems become unbalanced line and transformer losses and regulation increase. Fortunately, a small unbalance has very little effect on system operation. The losses and regulation vary with the values of positive, negative and zero sequence voltages and unequal currents resulting therefrom. These relative sequence values may be looked upon as a measure of the amount of unbalance.

For the study of a normally unbalanced system or a balanced system under fault conditions it is desirable to know the sequence values. The accompanying chart has been developed to give the positive and negative sequence values of any three-phase system if the line-to-line voltages are known. The chart will not give zero sequence values; however, such values do not exist on a delta or isolated system or one operating normally and having but one ground connection.

The chart gives the positive and negative sequence voltages from wire to neutral, which values are the ones ordinarily used. Values secured from the chart may be used to check those secured by more rigorous calculations. The angles the sequence voltages have with the line-to-line voltages cannot, however, be found from the chart. When there is neither neutral connection nor line fault (zero sequence currents are zero) the positive and negative sequence values for current can be de-



Nomogram determines positive and negative sequence voltages

Example—Assume line-to-line voltages $V_{AB} = 240$ volts, $V_{BC} = 200$ volts and $V_{CA} = 180$ volts. Starting at the left, connect the values 200 and 240, locating a point on the Z scale. From this point through the value 180 extended locate the point 7210 on the positive side of the Q scale. Next starting on the right side of the chart connect 240 and 200 and locate a point on the X scale. From this point through the value of K extended locate a point on the R scale. (The value of K is determined from the small circular insert, by making two pencil marks on the edge of a piece of paper, the distance between them representing the voltage $V_{CA} = 180$. Voltages $V_{AB} = 240$ and $V_{BC} = 200$ are already scaled off on this insert. Use of the piece of paper to complete the triangle determines the value of K, in this case 0.142.) The value on the R scale is next transferred to the Y scale and this point connected to the point on the Q scale, which was originally found to be 7210. Where the line crosses the positive sequence scale the value of positive sequence voltage is found to be 118.5 volts. The value of 7210 is then located on the negative side of the Q scale and this connected to the point on the Y scale, thus locating the value of 19.8 for the negative sequence voltage.

For single phase lines the value of Y will always be zero. This makes the positive and negative sequence voltages to neutral of a single-phase line equal to each other and one-third the line-to-line voltage. The effect on sequence voltages of a change in the line-to-line voltages can easily be followed.

Sleet-Breaking Contacts with Maximum Conductivity Feature

Kearney ROTATING TYPE

GANG SWITCH

Ratings — 7.5 to 115 KV. Inclusive
400 - 600 - 1200 AMP.

It's a New KEARNEY PRODUCT

IT SOLVES UTILITY PROBLEMS — IT COSTS NO MORE

First, note the skillful application of high conductivity, multiple point pressure contacts on this switch which fully meets N.E.M.A. requirements. In closed position the contacts in the jaws of the switch arm head are held under pressure against the contacts on the front insulator. As the switch opens, a toggle releases the pressure and simultaneously the jaws open with a sleet-breaking action. . . . But you must operate this switch to appreciate its easy action and mechanical and electrical perfection.

TO GET MAXIMUM CONDUCTIVITY and to assure positive performance, even under sleet conditions, multi-point pressure, flexing contacts have been incorporated into the design of this new, sturdy, long-lasting Kearney Rotating Type Gang Switch . . . current carrying parts in this switch are high copper alloy—extra heavy cross-section provides safe and sufficient conductivity of loads, over and above the switch current rating . . . toggle action at the contact, balanced design, proper leverages—these are features which give this switch easy operation . . . a switch ruggedly built to handle today's and the future's increasing loads. . . . But you'll readily recognize the superior advantages of this precision-built, smooth-performing switch which operating men are installing on their more important, high revenue lines. There's nothing else quite like it on the market today. Don't fail to inspect it—or write for details.

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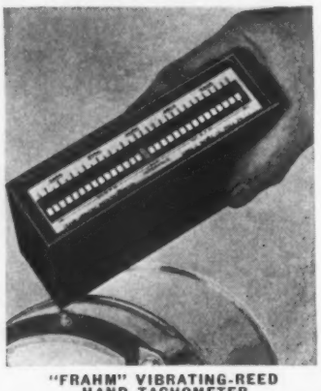

"FRAHM" VIBRATING-REED HAND TACHOMETER

measures speed simply by touching some stationary part. Ranges from 800 up to 30,000 r.p.m.

"JAGABI" SPEED INDICATOR

A "vest-pocket" chronometric instrument for any speed up to 20,000 r.p.m.

NEW "JAGABI" UNIVERSAL HAND TACHOMETER

Centrifugal type. Pointer turns twice around dial. Three ranges up to 40,000 r.p.m.

We are "headquarters" for instruments for measuring speed. Bulletins 1505-W and 1575-W describe a comprehensive line of precision instruments, including those here illustrated. Write for copies. Consult us regarding your speed-measuring problems.

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ELECTRICAL INSTRUMENTS

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termined from the same chart, using line current values in the place of line-to-line potential values.

•

Phototubes Measure Output of Flash Bulb

Measurement of the magnitude, duration and timing of the flash from photoflash bulbs with respect to the ignition current and the flash of the primer is accomplished at the Electrical Testing Laboratories, New York, by means of the unique photo-electric apparatus illustrated herewith.

Apparatus consists essentially of two photo-electric cells, one that intercepts the light produced by the foil and a second one that picks up the light from the primer, or filament that ignites the foil. Output of these cells is amplified and applied to the galvanometers of a six-element oscillograph, to which is also connected a 1,000-cycle oscillator for timing purposes.

The phototube that intercepts the light produced by the foil is mounted in a dark chamber with the photoflash bulb and in line with it. Flash of the primer is detected by the second phototube, also mounted in the dark chamber but located under the photoflash bulb. The primer is hidden usually well in the center of the foil and is only visible from the bottom of the lamp. This phototube "sees" the flash of the primer by reflection from mirrored concentric rings around the floor of the chamber immediately under the flash bulb.

The phototube which picks up the light from the flash bulb is corrected to the spectral sensitivity of photographic film, correction being made by means of a compound filter containing both liquid and glass components. The equipment is standardized from a standard lamp operating at 2,360 deg. K. and a D&G No. 2 liquid filter, the combination producing light having the color of noon sunlight.

A three-stage reverse feedback, battery-coupled photocell amplifier is used which has been carefully checked for static and dynamic linearity and for phase lag. The static linearity is practically perfect and the dynamic linearity and phase lag were checked by artificial surges and found to be satisfactory for the purpose.

Output of the amplifier is fed through a reflecting ballistic galvanometer connected across a shunt in series with the oscillograph galvanometer. To keep the dark current fluctuations from causing errors, a relay connects the ballistic galva-

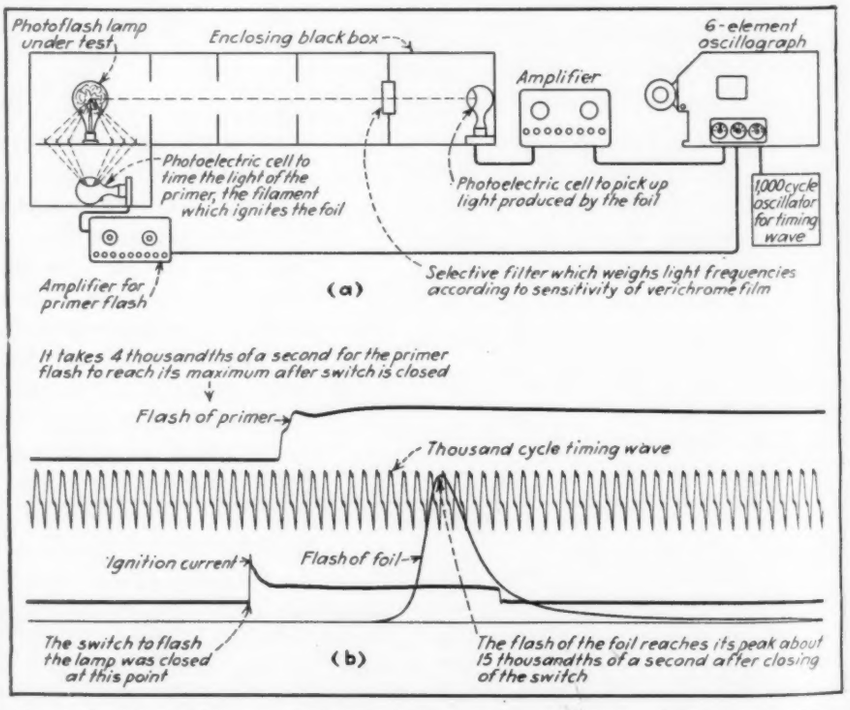
Photoflash lamp under test
Enclosing black box
6-element oscillograph
Amplifier
Photoelectric cell to time the light of the primer, the filament which ignites the foil
Photoelectric cell to pick up light produced by the foil
1,000 cycle oscillator for timing wave
Amplifier for primer flash
(a)
Selective filter which weighs light frequencies according to sensitivity of verichrome film
It takes 4 thousandths of a second for the primer flash to reach its maximum after switch is closed
Flash of primer
Thousand cycle timing wave
Ignition current
Flash of foil
The switch to flash the lamp was closed at this point
(b)
The flash of the foil reaches its peak about 15 thousandths of a second after closing of the switch

Photo-electric equipment measures intensity and timing of light from photoflash lamps—(a) Schematic diagram of apparatus; (b) typical oscillogram

nometer into the circuit just before the flash and another disconnects it after the flash. The latter relay is delayed sufficiently so that it does not operate until after the end of the flash has been passed. The circuit is so arranged that the relay operations do not affect the galvanometer shunt resistances.

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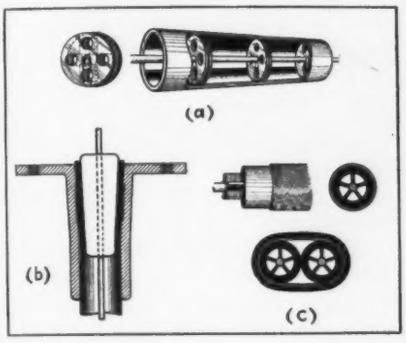
Air Dielectric Cable for High Frequency

Television has brought the range of practical frequencies up to at least a megacycle. For cables used on such frequencies where high breakdown

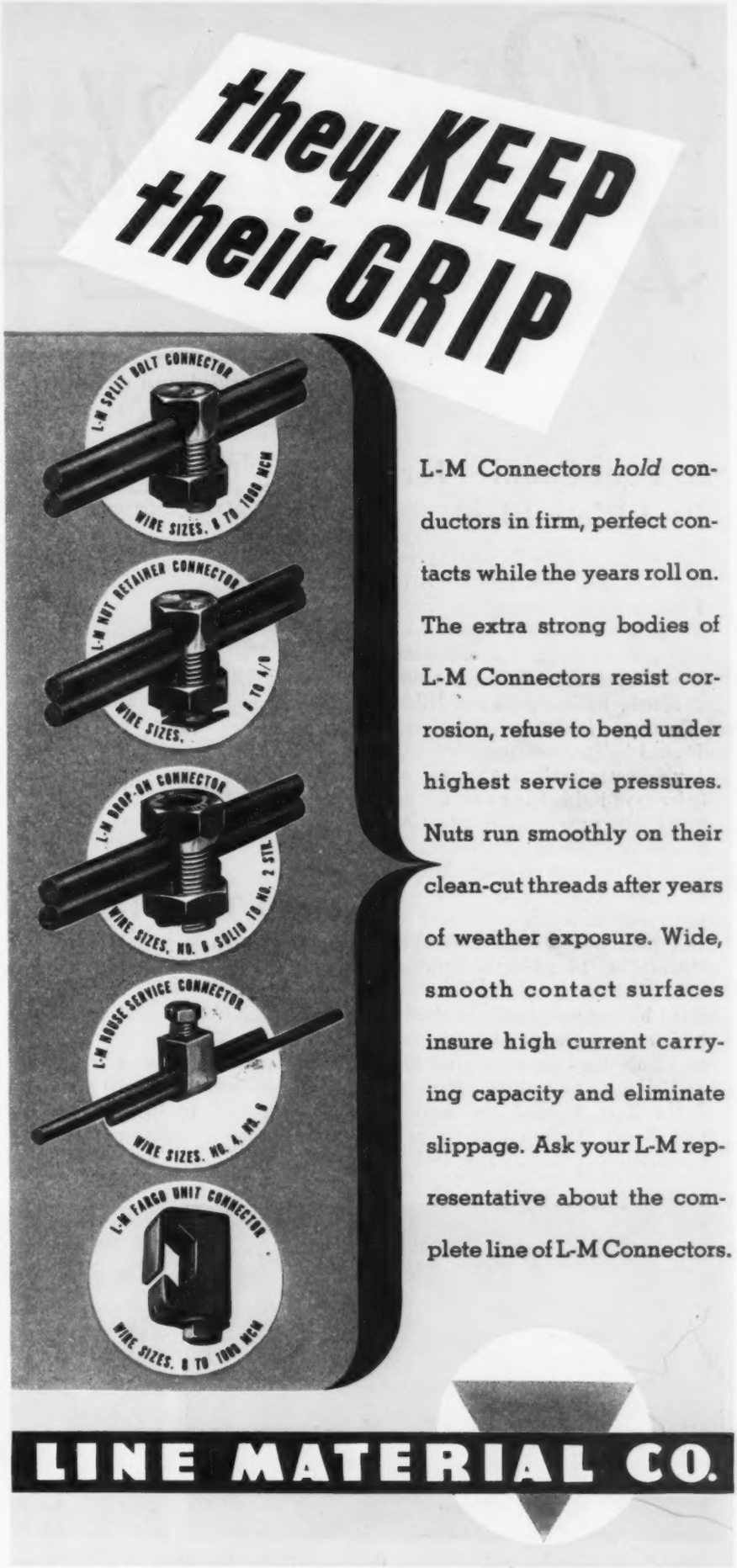


Foreign high-frequency cables take different forms

(a) Insulating disk supports conductor within lead sheath.
(b) End terminating gland with inner and outer conductors gripped by taper plug in gland with tapered opening.
(c) Tube-insulated cable, single and screened twin types.

strength is not of paramount importance, dry air is the ideal dielectric, according to E. W. Smith in a paper in the May 6 issue of the *Electrical Review*.

The three chief types of high-frequency cables may be classified according to the means adopted for keeping the conductors separated in the surrounding air, referring particularly to the coaxial construction. The chief methods of construction are (1) by insulating disks disposed laterally on the center conductor at regular intervals along the length of the cable; (2) by open helices of insulating material wound continuously around the center conductor, and (3) by insulating tubes in which the conductor is centered either by regularly spaced lateral constrictions or longitudinal ribs in the tube or by kinks in the conductor itself. In general, the first type has the advantage of requiring the least amount of solid dielectric.


they KEEP their GRIP
L-M SPLIT BOLT CONNECTOR
WIRE SIZES, 8 TO 1000 MCM
L-M NUT RETAINER CONNECTOR
WIRE SIZES, 8 TO 4/0
L-M DROP-ON CONNECTOR
WIRE SIZES, NO. 8 SOLID TO NO. 2 STR.
L-M HOUSE SERVICE CONNECTOR
WIRE SIZES, NO. 4, NO. 8
L-M FARGO UNIT CONNECTOR
WIRE SIZES, 8 TO 1000 MCM
L-M Connectors *hold* conductors in firm, perfect contacts while the years roll on. The extra strong bodies of L-M Connectors resist corrosion, refuse to bend under highest service pressures. Nuts run smoothly on their clean-cut threads after years of weather exposure. Wide, smooth contact surfaces insure high current carrying capacity and eliminate slippage. Ask your L-M representative about the complete line of L-M Connectors.
LINE MATERIAL CO.

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

22 Foot-Candles for Steel Plate Plant

"We are heartily in accord with your idea that good lighting is one of industry's most important production tools." This statement is quoted from a letter to the Commonwealth Edison Company, Chicago, written by Martin Bailer, president Hibben & Company, fabricators and erectors of steel plate structures such as blast furnaces, tanks and stacks. Mr. Bailer says in his letter that the new shop lighting recommended by Commonwealth Edison engineers has helped to increase shop efficiency in two ways. The men find the work easier and their time is saved because unnecessary material handling is minimized by adequate lighting.

The Hibben shop was formerly served by 300-watt lamps in shallow bowl reflectors mounted at the ceiling. With this light system for high bay lighting a very small percentage of the light reached the working area. Heavy shadows were the most objectionable feature. The lack of general illumination necessitated local lighting for any fine work. New 500-watt Alzac distributor-type reflectors replaced the 300-watt units. This layout was made with the idea that two rows of high-intensity mercury lamps may later replace each single row of 500-watt incandescent lamps. The units in the new installation are mounted on 22-ft. centers. The illumination has an average of 22-ft.-candles, which is considered sufficient illumination for the type of work done in this particular plant. Note the uniform distribution of light over the work areas.

•

Small Town Hall Has Advanced Lighting

By HORACE W. MYERS
Lighting Engineer,
Central Massachusetts Electric Company,
Palmer, Mass.

Ware, Mass., has a remodeled town hall seating 750 on the main floor and 200 in the balcony, improved electric lighting playing a vital part in the satisfactory use of this auditorium. Following a fire, Thomas E. Madigan, local architect, was commissioned to reconstruct the building at a total cost of about $110,000, adhering to the original design as far as practicable and still bringing the interior up to date in equipment and appearance.

As rebuilt, the auditorium is 90 ft. long including the balcony, 55 ft. wide and has a maximum ceiling height of 31 ft. The floor seats 750. The lighting in the original hall consisted of one large suspension fixture having two concentric rings 4 and 6 ft. in diameter, respectively, with bare lamps placed ou 6-in. centers around the ring perimeters. This has been replaced by a modern recessed installation of fifteen units in three rows of five units each. These are placed on 18 x 19-ft. centers, each unit consisting of four 12-in. holophane lens plates (No. 765), with the prismatic reflectors being designed for 200 watts per plate. The recessed roughing boxes are arranged for relamping from above, thus providing for

Before and after relighting in a steel plate shop

NON-METALLIC UNDERGROUND CABLES *Simplified*—

The new Simplex Non-Metallic Rubber Jacketed Underground Cable has just four elements —

Conductor.
Low water absorption rubber insulation.
Re-enforcing rubber filled tape.
Hard service rubber jacket.

There are no metallic coverings to cause electrolysis, sheath currents or corrosion.

The insulation over the conductor is Simplex-ANHYDREX deproteinized rubber, the only rubber insulation that will not absorb harmful quantities of water after prolonged submersion. The jacket on this new cable is a 60% rubber hard service jacket.

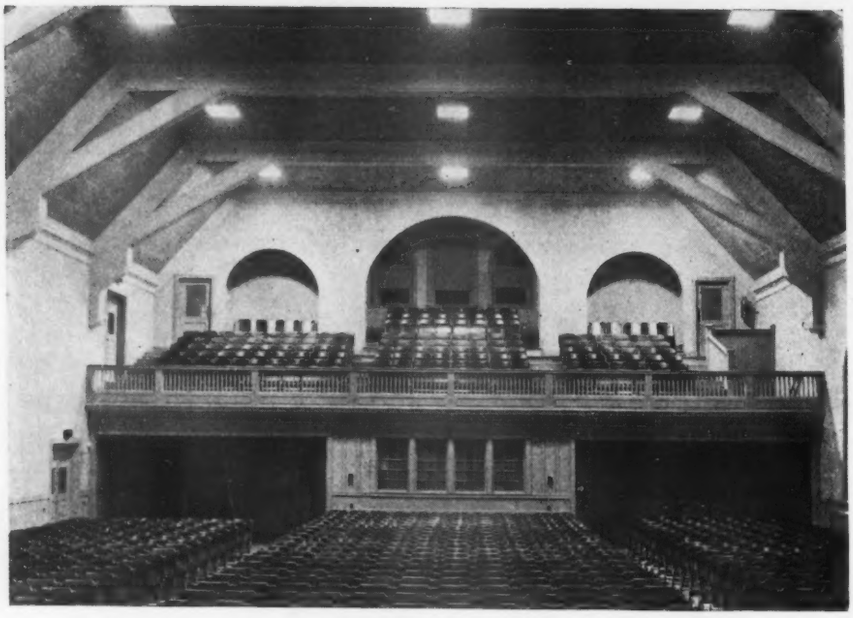
In addition, this cable can be laid directly in moist ground or in conduits. If it is installed in conduits no messy grease or other lubricant is necessary. Simply wet the cable with water and pull the cable in. There are no outer fabric coverings, tars, pitches, etc., to deteriorate in acid or alkaline waters and clog ducts or become "frozen in."

We will be glad to send you a new booklet on this cable upon request. The booklet will show you many advantages and money saving features of this cable that you will want to know about.

Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.

Simplex-ANHYDREX AA

deproteinized rubber insulation for wires and cables



Eleven foot-candles cheer Ware citizens in town gatherings

easy accessibility to the units. At present the installation is being operated with four 150-watt lamps per unit, a total of 9 kw., or 1.74 watts per square foot of floor area. Under these conditions the average intensity of light 30 in. from the floor, taken under night conditions, is 11 ft.-candles. Lighting under the balcony consists of small wall units used in connection with the exit lights. These units were not switched on when the accompanying installation was made.

Fourteen Circuits Used

The lighting is controlled from a Trumbull switchboard located on the stage. Fourteen circuits are used and are so arranged that two opposite plates in alternate units of each row are on the same circuit. In this way maximum flexibility is obtained.

The side walls are of rough plaster finished matte white, while the ceiling is of 1-in. buff Arborite cut in 24-in. squares, giving a modern yet conservative appearance.

•

Use New Material in Remodeled Front

One of the early installations of Vitrolux, a new translucent glass for sign fronts, was made by lighting engineers of the Danbury & Bethel Gas & Electric Light Company in the course of modernizing the lighting of the Pershing pharmacy in Danbury, Conn. The accompanying illustration shows the installation as it appears at night.

Vitrolux, a Libby Owens Ford product, consists of a heat-treated plate glass panel with a letter and contrasting background color of glass fused to the plain glass plate. In the installation illustrated a navy blue letter was used on a canary yellow background. The structural glass outlining the sign was dark blue. The two major panels of the sign were 30 in. high by 28 ft. long on one side and 30 in. by 35 ft. on the other side.

The panels are illuminated from the rear by 100 bare 50-watt lamps in light boxes trapazoidal in shape. These boxes, which are about two-thirds as deep as the panels are high (30 in.) are painted flat white inside and provided with the necessary ventilation openings to allow dissipation of heat from the lamps.

Early installation of new transparent sign front material

•

High Revenues Derived in Tulsa

Despite varying revenues from different types of commercial lighting loads and from varying applications of the same type of loads, Public Service Company of Oklahoma anticipates an annual revenue of $55 per kilowatt from its 1937 sales, according to its presentation for the Curtis Award.

In the period between March 1, 1937, and March 1, 1938, 2,800 customers who had not previously been called upon were contacted by the company's sales forces. Fifteen hundred and seventy-five recommendations were submitted to customers and the following installations were made:

Type of Installation	No. of Installations	Added Kw.	Av. Watts per Inst.
Industrial	26	28	1,077
Store interior..	249	202	813
Show window..	38	42	1,095
Sign	34	12	365
Office	128	273	2,132
Bldg. floods....	5	3	670
Outdoor floods..	32	58	1,801
Sports outdoor.	10	183	18,300
Service station.	170	122	719
Miscellaneous ..	26	43	1,640
	718	966	1,346

This load is expected to produce an average annual revenue of about $53,000, calculated at an average rate of $55 per kilowatt per year.

Sales costs for the period are reported to be 33 cents per dollar of E.A.R. These costs include salaries, supplies, equipment, traveling expenses, advertising and kindred expenses, as well as charges designed to cover the cost of executive supervision. They do not include rental charges for office space.

CONTINUALLY *Improved* FOR 30 YEARS

CHROMEL

Heating Element WIRE

Chromel HEATING ELEMENT WIRE

THE WIRE THAT MADE ELECTRIC HEAT POSSIBLE

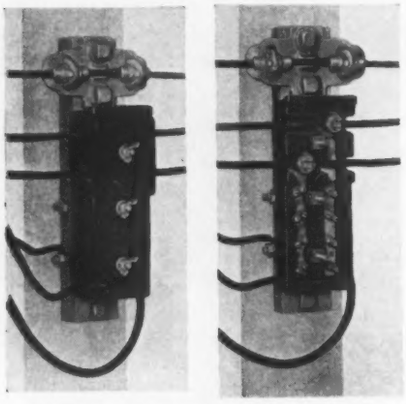
In making Chromel heating-element wire, we do not bring out "new yearly models." Instead, we keep hammering away at making Chromel better, all the time. So, whatever your interest in electric heat and heating devices, you may have full confidence in Chromel which has steadily been improved over a stretch of 30 years.

HOSKINS MANUFACTURING COMPANY • DETROIT • MICHIGAN

New EQUIPMENT AVAILABLE

Secondary Service Box

Stated to simplify greatly line construction where multiple service taps are taken from a single box, a new secondary service



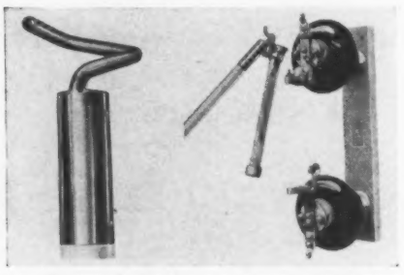
Secondary service box. **Line Material Co.,** South Milwaukee, Wis.

box is offered for use with cabled secondaries. Box has a capacity of four services of two or three wires each. All live parts are inclosed in wet-process porcelain housing. Two through-bolts clamp channel base to pole and built-in clamps grip the messenger wire.

•

Safety Switch Stick

In place of the more customary short, steel hook extending at right angles to the stick, this new switch stick has a 6-in. length of tempered steel rod, bent into a spiral shape for pulling, grasping and carrying. Hook is twisted through the disconnect blade, cutout or fuse ring and grips it with positive control, guarding against damage to insulators or accidental contact with other live parts. Because of its special hook and light weight, it is claimed, the stick can be used for many kinds of overhead line work, the grip of the hook permitting the device to be operated at a side angle at which the more conventional stick would not work.



Safety switch stick; types provided for both station and line work, the latter provided with sectional extensions. **Schweitzer & Conrad, Inc.,** Chicago, Ill.

•

Rheostat Inclosures

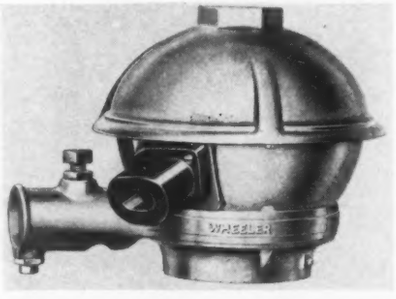
Explosion-proof inclosures for pressed steel rheostats; acommodate 8, 13 and 15½-in. rheostats. **Ward Leonard Electric Co.,** Mount Vernon, N. Y.

Explosion-proof inclosures for pressed steel rheostats are of the "air-break" type for installation in oil refineries, filling stations, distilleries and similar locations where explosive gases, such as from gasoline or alcohol, are present.

•

Street Lighting Fixture

Simplicity of design is one feature of new all-metal heads for straight series street-lighting circuits. With a crown, body, three types of holders, a "banjo" support and fittings, as many as fifteen different assemblies can be devised, it is stated. The



All-metal "Wheeler" head; inside insulated; for all straight series circuits up to 7,500 volts. **Wheeler Reflector Co.,** Boston, Mass.

unit accommodates series lamps from 600 to 10,000 lumens and may be converted to multiple operation by using an adapter. They are said to have a flashover voltage to ground of 28,000; all live metal parts are so inclosed within the wall of the insulator that no direct ground is possible, it is claimed.

•

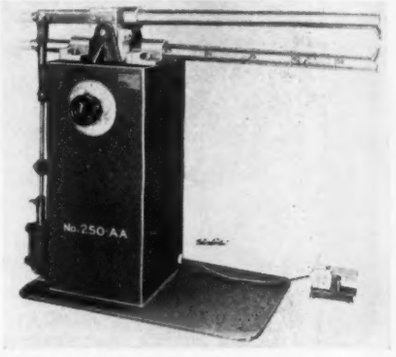
Nickel Alloy

"Z" nickel; electrical resistivity, 84-96 ohms per mil-ft. at 20 deg. C. **The International Nickel Co., Inc.,** 67 Wall St., New York, N. Y.

This new alloy is said to combine the corrosion resistance of nickel with the mechanical properties of heat-treated steel. Although termed an alloy, it contains 98 per cent nickel, and is said to have from two to 4½ times the strength of ordinary structural carbon steel. It is suggested for various electrical applications.

Spot Welder

Both the upper and lower horns on this spot welder can be lengthened or shortened to the desired type and size of work, the



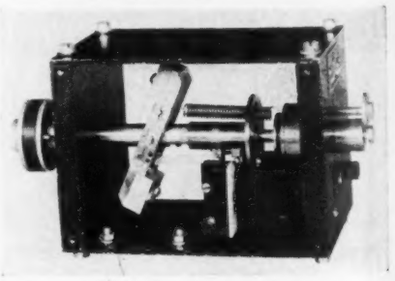
"Universal" spot welder; in three sizes, from 5 to 25 kva., from 25 to 50 kva., from 40 to 75 kva. **Eisler Engineering Co.,** Newark, N. J.

maker stating that this feature makes it possible to weld light and heavy work and deep metal parts. Markings on the lower horn represent the kva. ratings—with the horn on the "25" mark, 25 kva. are represented. Offered for foot, air or motor operation, the welders will make from 30 to 150 spots per minute, depending on type of work.

•

Centrifugal-Speed Relay

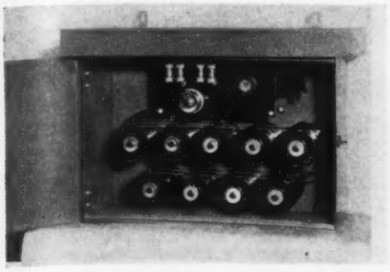
Feature of a new centrifugal-speed relay for controlling rotating machinery in the speed ranges between 70 and 4,000 r.p.m. is that it is adjustable in operation. Calibration within range of the relay may be made without stopping the machine; the relay may be set to indicate excessively high or low speeds or both, and for synchronous-speed indication as well. Mechanism consists of rotor proper, with variable detachable weights, balancing spring and contact-tripping linkages.



Type "GCR-10" centrifugal-speed relay, with side covers and conduit box removed. **General Electric Co.,** Schenectady, N. Y.

Cathodic Protection

To counteract galvanic action of underground pipe lines, cables, etc., a copper-oxide "rectox" rectifier has been developed



"Rectox" rectifier for cathode protection; ratings range from 3 to 50 volts, 1 to 125 amp. d.c. output. **Westinghouse Electric & Mfg. Co.,** East Pittsburgh, Pa.

for cathodic protection. The new device consists of the necessary rectox units for the desired rating, together with a two-winding transformer, disconnect switch and terminal board in ventilated cases designed for either outdoor or indoor use.

•

Voltage Control

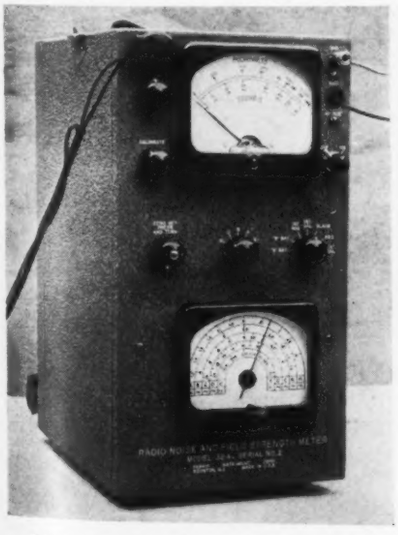
Columbia Electric Co., Cleveland, Ohio.

This company has developed a new type of controller for use with low-voltage, high-amperage generators where a very close control of the voltage is required. Particularly for laboratory use, it replaces the standard field rheostat and separate exciter. For example, on a 6-volt generator, where it is frequently required to use voltages between 0 and 6 volts, this controller will enable the operator to set the voltage at any point within 0.1 of a volt.

•

Noise Meter

New radio-frequency microvoltmeter is offered for making measurements of noise voltages on lines and conductors, testing of electrical equipment, noise surveys and similar service. It employs a self-contained calibrating generator, giving the user the facilities to calibrate the noise meter, thus making for actual measurements of noise,



Model "32" radio noise and field strength meter; frequency range of 150 to 350 and 550 to 20,000 kc.; voltage range 1 to 100,000 microvolts. **Ferris Instrument Corp.,** Boonton, N. J.

rather than comparisons. Output meter uses a logarithmic scale, as the most suitable type to take care of the wide and rapid variations met with in this field of measurement. In indoor service it is operated from a 115-volt line; in the field it may be operated from dry batteries or from a vibrator pack.

•

Electric Heater

Developed for giving a spot heat for upset work, tempering or annealing, this one-electrode horizontal heater is equipped with a low-temperature photo-electric cell,

"a.c.f. Berwick" electric "No. 1" one-electrode type "C" horizontal heater. **American Car & Foundry Co.,** 30 Church St., New York, N. Y.

for working from 1,100 to 2,300 deg. It is also equipped with a time clock to provide for a soaking heat from a split second upward and with a resistor, to give increased or decreased resistance to the material being heated.

•

Utility Truck

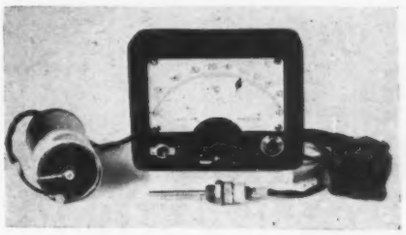
By merging cab and body in this utility truck, it is claimed that 18 inches of platform length is reclaimed. Vacuum clutch

"4406" body; mounted on standard 160-in. wheelbase cab-over-engine chassis. **American Coach &Body Co.,** Cleveland, Ohio.

winch is shifted by lever on dashboard. On the left side of the body is an emergency door of the conventional hinged type with drop glass. This door is not full length, in order to permit the opening of the door while the pole derricks are being carried. A "caboscope" mounted on the roof of the cab provides the operator with a clear view of derrick operations.

Resistance Thermometer

Lead lengths can be used without affecting the accuracy of this new resistance thermometer; it is also claimed the instal-



Model No. 62 RT resistance thermometer; continuous current drain from battery is 12 milliamp.; instrument covers a total temperature span of 100 deg. F., in desired range. **The Lewis Engineering Co.,** Naugatuck, Conn.

lation can be used under conditions of extreme vibration such as are met with in moving vehicles. For the measurement of temperature at one point or at several remote points, the instrument itself contains an off and on switch and voltage regulator for the battery current as well as voltage regulator check switch. As accessories, there are an ordinary dry cell, a rotary selector switch of the desired number of positions and an appropriate number of "fast action" resistance bulbs.

•

Battery Charger

"B-L" rectifier-type portable battery charger; for either lead-acid or nickel-iron batteries; charging rate, 200 amp. for 40-volt, 100 amp. for 80-volt battery. **The B-L Electric Mfg. Co.,** St. Louis, Mo.

Copper-sulphide magnesium rectifiers, cooled by a stream of air from multi-blade fans, are used to convert three-phase a.c. to d.c. in this portable battery charger. Three-phase transformer reduces supply line voltage to proper potential for the rectifiers. Automatic charge rate control is accomplished by a circuit using a special relay and a self-adjusting ballast resistor.

•

Synchronous Motor Drive

New development is said to simplify greatly wiring and installation and to reduce floor space needed for direct-connected synchronous motor drives for reciprocating

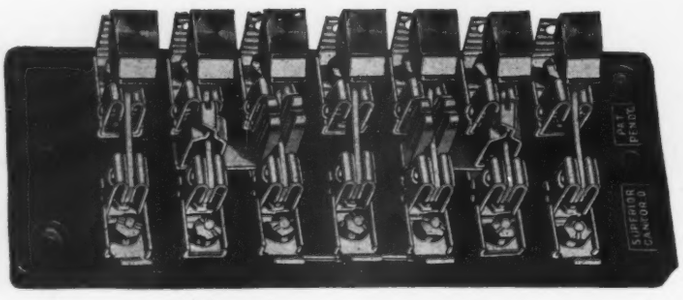
MOTOR-MOUNTED V-BELT DRIVEN EXCITER
ENCLOSED FIELD FREQUENCY RESPONSIVE FIELD CONTROL
SYNCHRONOUS MOTOR DIRECT CONNECTED TO COMPRESSOR
ONLY THREE POWER LEADS AND A CONTROL CIRCUIT BETWEEN MOTOR AND LINE CONTROL

"Packaged" synchronous motor drive for reciprocating compressors. **Electric Machinery Mfg. Co.,** Minneapolis, Minn.

TEST SWITCHES

FOR

TESTING
CALIBRATING
DISCONNECTING
– METERS
RELAYS
INSTRUMENTS



Superior Test Switches are rugged and safe. Using the famous Superior "One-piece-jaw" construction they add a minimum number of joints to the circuit. They come in a variety of arrangements to meet your test switch needs.

Write for Test Switch Bulletin No. 3401

Superior Switchboard & Devices Company

CANTON, OHIO

*Been at it Since 1920

SUPERIOR

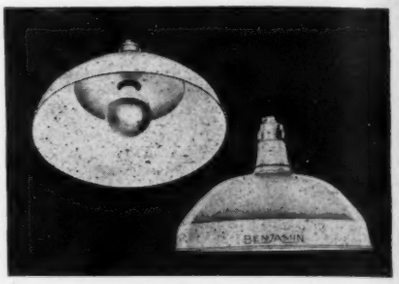
REG. U. S. PAT. OFF.

compressors such as are used for refrigeration in air conditioning. Field-control equipment for synchronous motor, as well as exciter, is mounted on top of motor; thus the motor can be shipped with all wiring completed between motor, exciter and field control. Only wiring required on the job is between motor and line control switch.

•

Lighting Reflector

New lighting reflector has been designed to utilize the indirect lighting characteristics of the silvered-bowl Mazda lamp. Three essential elements are the silvered-bowl lamp and the porcelain enamel reflecting



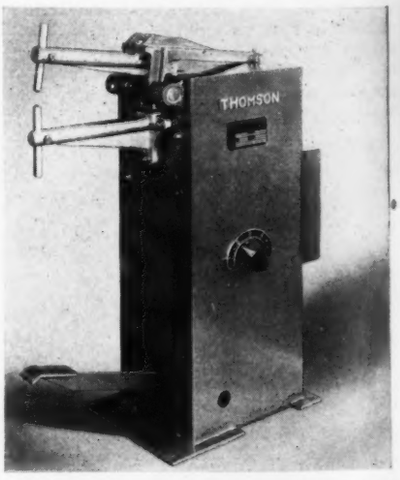
RLM "Silvered Bowl" diffuser. **Benjamin Electric Mfg. Co.**, Des Plaines, Ill.

surface with a semi-specular Alzak aluminum reflector insert. Aluminum reflector is located in the top of the unit and redirects light from the silvered-bowl lamp downward and outward in a manner which avoids interception of the light rays be the lower edge of the porcelain enamel reflector.

•

Spot Welder

Both pressure and current for this spot welder are applied by the foot treadle, which actuates the upper welding arm through a pressure spring and back bar. A switch mounted on the back bar controls the welding current. Welding pressures, which may be adjusted up to about



Model "B" spot welder; capacities 10, 15 and 20 kva. **Thomson-Gibb Electric Welding Co., Lynn, Mass.**

200 lb., are changed by means of a hand wheel at the rear of the machine. The heat regulator is provided with five points to give as many values of welding current. Current timing is governed by the speed with which the operator pushes through on the foot treadle. Machine is suggested for medium-duty range of work in sheet metal and general welding shops.

The Three Musketeers

OF TROUBLE-FREE PERFORMANCE

3 SIZES

TYPE 680 . . . FOR VOLTAGES UP TO 15,000
TYPE 670 . . . FOR VOLTAGES UP TO 10,000
TYPE 660 . . . FOR VOLTAGES UP TO 8,000
Handle most PRIMARY line requirements

● Here they are! The three invincible HEMINGRAYS! So tough, they laugh at old age. So *strong,* they defy the hardest usage and most rigorous service. So *versatile,* they are equally efficient under either light or heavy loading conditions. So *economical,* they reduce initial and over-all costs to a minimum. So *competent,* they overcome outage loss. One for all . . . all for one, these great new HEMINGRAY Glass Brass-Bushed Insulators provide a longer life of better insulator service than has ever been known before. Send for samples . . . subject them to the most gruelling tests . . . and see them *deliver.* Owens-Illinois Glass Company . . . "FIRST IN GLASS" . . . Hemingray Division . . . Muncie, Indiana.

● Owens-Illinois is the world's largest manufacturer of glass containers and producer of INSULUX Glass Block, DUST-STOP Replacement-Type Air Filters, FIBERGLAS Insulating Wool, Insulating Blankets and Filter Cloth.

HEMINGRAY INSULATORS

OWENS-ILLINOIS GLASS COMPANY

"First in Glass"

News ABOUT PEOPLE

H. P. Liversidge Named Head of Philadelphia Electric

Horace P. Liversidge, who was elected president of the Philadelphia Electric Company at a recent meeting of the board of directors, became identified with the Philadelphia utility in 1898. He succeeded to numerous

H. P. Liversidge

W. H. Taylor

supervisory positions until his selection as a vice-president in 1924. Two years later, he assumed his present position as vice-president and general manager. He was elected a director in 1936.

Mr. Liversidge has gained national repute for his activities in both local and national electrical and engineering fields. In 1932 he was given the James H. McGraw Award "in recognition of his distinguished contribution to the advancement of co-operation in the electric industry."

He has been chairman of the Philadelphia sections of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, and is a past-president of the Association of Edison Illuminating Companies and of the Electrical Association of Philadelphia. He is now a member of the operating committee of the Edison Electric Institute.

William H. Taylor, who was elected chairman of the board of directors to succeed John E. Zimmermann, was operating vice-president of the United Gas Improvement Company when elected president of Philadelphia Electric in 1928. On May 1 last he completed 36 years of service with the U.G.I. system in various sections of the country. He was vice-president and general manager of the Georgia Power Company immediately prior to his return to Philadelphia in the capacity of vice-president of U.G.I.

•

Indiana Utilities Select New Chief Executives

Departing from previous policy, the board of directors of the Public Service Company of Indiana and the Northern Indiana Power Company elected on September 22 individual presidents.

Robert A. Gallagher of Indianapolis was elected to the presidency of the Public Service Company of Indiana from the position of vice-president which he had held under the late John N. Shannahan. L. B. Schiesz was elected president of the Northern Indiana Power Company. As vice-president and general manager, Mr. Schiesz had been actively in charge of the company under Mr. Shannahan.

The announcement of the election of the new presidents pointed out that the

R. A. Gallagher

selection of top executives from the operating personnel of the companies placed men in charge who had "intimate knowledge of their company's affairs and a close relationship with the operating personnel as well as the public in the territory served by each company."

D. P. Pardee and G. J. Oglebay, both of Indianapolis, were elected vice-presidents of the Public Service Company of Indiana. P. H. Palmer of Kokomo was elected vice-president of the Northern Indiana Power Company. Paul D.

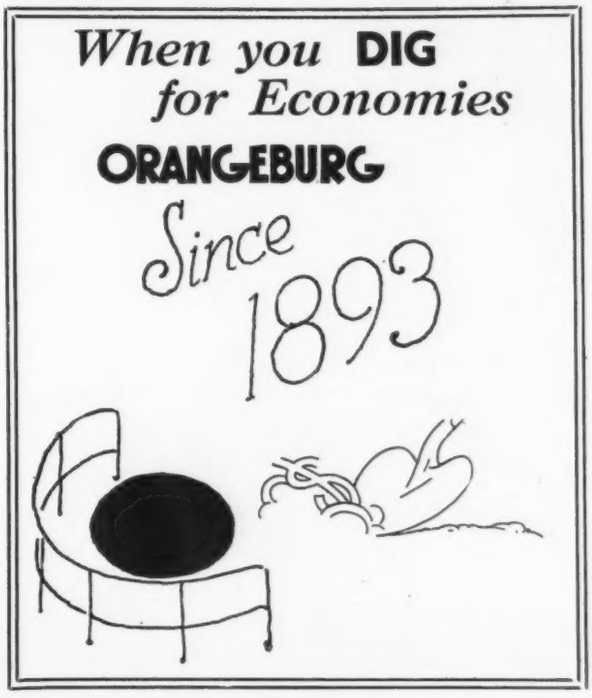
L. B. Schiesz

• *When you "dig" for "distribution"*

you consider not only immediate costs but the ultimate economy of a substantial capital investment.

Where good engineering practice requires concrete encasement, as in duct banks, main distribution, high tension and "downtown" underground, Orangeburg Standard Fibre Conduit offers not only immediate savings but complete and permanent cable protection and raceway facilities.

ORANGEBURG *Standard* FIBRE CONDUIT
for use Underground WITH Concrete Encasement



Now

ORANGEBURG

NOCRETE *the new Dual Economy* CONDUIT

For use underground *WITHOUT* Concrete encasement

Where good engineering practice suggests installations of conduit without concrete encasement; Orangeburg NOCRETE offers real savings in both initial material and installation costs. Its cost is about 50% that of metal pipe and *less* than non-metallic conduits of any comparable quality. Naturally installation costs are much lower,—easier to handle—easy to cut or tool—adaptability to rounding curves or obstructions—and quick field assembly.

Specify Orangeburg NOCRETE for service entrances, extensions, parkways and street lighting, suburban services, laterals, etc. Save money not only TODAY but also *in the future* from many years of service without maintenance costs.

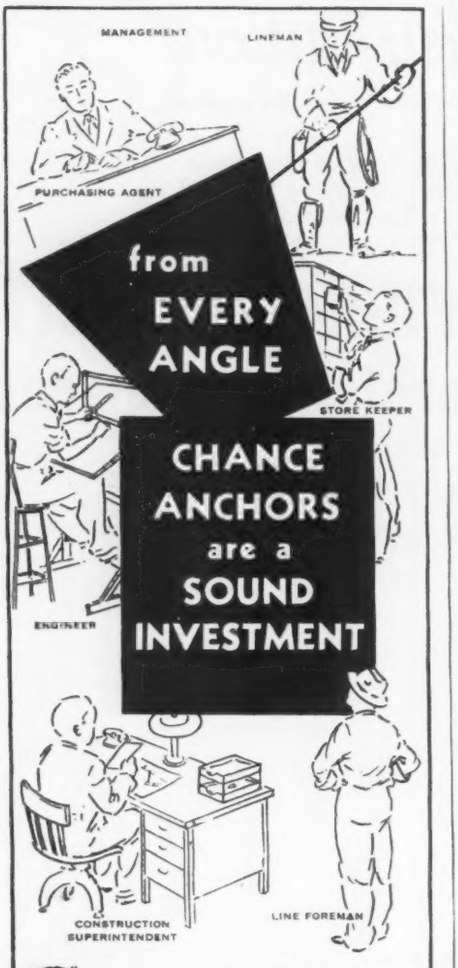
THE FIBRE CONDUIT COMPANY

Sales Agent **GENERAL ELECTRIC SUPPLY CORP.**

ORANGEBURG

Sales Office 292 MADISON AVENUE, N. Y.

Sales Agent **GRAYBAR ELECTRIC COMPANY, INC.**



From the viewpoint of every man concerned with line construction and maintenance, Chance Anchors are a sound investment.

To management they mean line security — protection for capital invested in line construction.

From the purchasing department Chance Anchors get first consideration for many reasons—quality, dependability, price, adaptability to various needs, integrity of the manufacturer, and delivery service.

To construction superintendents the Chance complete line provides the right anchor for every job—dependable, economical results.

The Engineer relies on fact, fact proven by test. He knows that every Chance Anchor will do the job for which it is made because it has been proven.

To the store keeper Chance Anchors mean a complete, all round, stock from a single source of supply; an anchor for every requirement and a stock easily checked by Chance metal tags.

The line foreman selects Chance Anchors because he can be assured of a job well done in minimum time.

To the lineman Chance Anchors represent a better job with less effort — an anchor to meet each specific requirement, easier installation, easier handling and better results.

Build Security into your lines. Select your anchors from the complete Chance line of 18 types and 75 sizes.

Dept. B

A·B·CHANCE CO. Utilities Division

CENTRALIA MISSOURI

Birdsall of Indianapolis, secretary and treasurer of the Northern Indiana Power Company, was elected a director at the board meeting.

More than twenty years' experience in the utility field has been encompassed in Mr. Gallagher's business career. His associations include utility companies in Indiana as well as in other parts of the country.

Mr. Schiesz first became associated with the Indiana utility companies in 1912, and since that time, with the exception of five years with the Wisconsin-Minnesota Light & Power Company, has been connected with Indiana companies.

•

Schulten Named Executive in Illinois Companies

Walter F. Schulten has been elected vice-president in charge of administration of the Chicago District Electric Generating Company and of the Super-Power Company of Illinois, succeeding the late Louis E. Manley. Mr. Schulten has been with the two companies since their formation, about twelve years ago, and moves to his new executive position from the triple responsibilities of traffic manager, fuel agent and manager of industrial relations.

His previous connection was with

the United States Steel Corporation in traffic and transportation work. Mr. Schulten was educated in the local schools in Chicago, including Lewis Institute and Northwestern University.

•

▶ JOHN R. READ, vice-president of the Canadian Westinghouse Company, Ltd., was elected a director of the company at a recent meeting of the board.

▶ JOHN I. HOLBECK, who has been associated with the Minnesota Power & Light Company at Duluth as relay engineer for the past fourteen years, has been appointed to the engineering staff of the Bonneville project, at Portland.

Eugene Holcomb Retires from Consumers Power Staff

Eugene Holcomb, who has devoted his entire business career to the public utility industry, is retiring from active service with Consumers Power Company after fifteen years as a member

of the general office executive staff. Mr. Holcomb was the guest of honor at a dinner given recently in Jackson, Mich., by the officials of the company.

His interest in the electrical industry began in California, where he became identified with the construction and operation of several electric plants on the Pacific Coast. Later he and associates leased and operated electric properties in Springfield, Ill. Subsequently he was connected with the export department of Westinghouse Electric & Manufacturing Company in New York and in Buenos Aires, Argentina; with the foreign sales department of the Allis-Chalmer Company at Milwaukee, Wis., and with the H. M. Byllesby & Company interests in St. Paul, Minn. Returning to Michigan in 1913 he became president of the Continental Utilities Company at Lansing, continuing in that position for a number of years. He served also as general manager of the Central Michigan Light & Power Company with headquarters at Alma. When these properties were taken over by Consumers Power in 1924 he was assigned to its executive staff in Jackson.

Mr. Holcomb has served as president of the Great Lakes division of the National Electric Light Association, chairman of the National Committee on Rural Electric Service, president of the Michigan Electric Light Association.

•

▶ VICTOR A. HANSON, vice-president and chief engineer of the Power Transmission Council, Boston, Mass., has resigned to join the Whitney Chain & Manufacturing Company of Hartford, Conn. Mr. Hanson contributed sub-

Surge Tested!

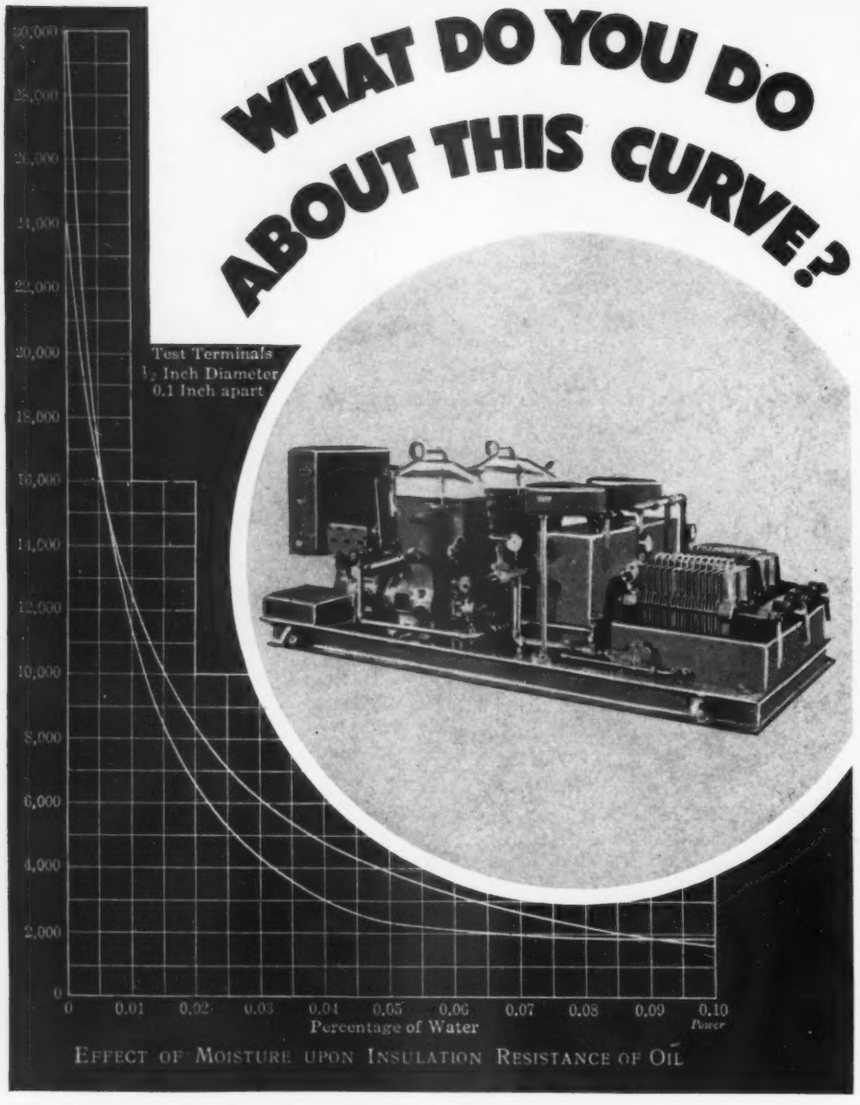
- The 163,000 volt single phase transformers in the above 48,000 Kva bank were surge tested on the Moloney 2,500,000 volt Surge Generator.

- Having the elaborate equipment necessary for surge testing high voltage power transformers such as these, is only a part of the story.

- The real job is to design and build transformers that will withstand these severe tests.

- Moloney designs and builds high voltage power transformers that not only successfully pass laboratory surge tests, but also provide many years of dependable service in the field.

MOLONEY TRANSFORMERS



NO NEED to tell electrical engineers that moisture in insulating oils means trouble—for but one part of water in 20,000 will halve the dielectric strength of oil. The important thing is what you do about it—how you remove accumulations of moisture and carbon.

A portable or stationary Goulds Hydroil Centrifugal Oil Purifier will do the job thoroughly, swiftly, and at low cost. These well engineered units are completely self contained —with heater, motor, and centrifuge on one mounting. They are easy to hook up—take but a few minutes to clean. Power companies everywhere are playing safe—protecting service by hydroilizing transformer, circuit breaker, and switch oils at frequent intervals.

Write today for Bulletin No. 503. It gives full information. If you have any particularly bothersome oil purifying problem, our competent engineering staff is at your service.

GOULDS PUMPS Inc.
SENECA FALLS N. Y.
ATLANTA, BOSTON, CHICAGO, HOUSTON, NEW YORK, PHILADELPHIA, PITTSBURGH, TULSA, Representatives in all Principal Cities

8583

stantially to the valuable work of the council since the inception of the plan in 1932.

▶ DR. P. G. AGNEW, secretary of the American Standards Association, has been elected an honorary member of the American Home Economics Association in recognition of his part in organizing work on standards for consumer goods.

▶ GEORGE A. BENGEL, president of the Springfield Transportation Company, has been appointed manager of the Springfield division of the Central Illinois Light Company to succeed the late A. D. Mackie. Mr. Bengel has resigned as head of the transportation company, a position he has held since 1933.

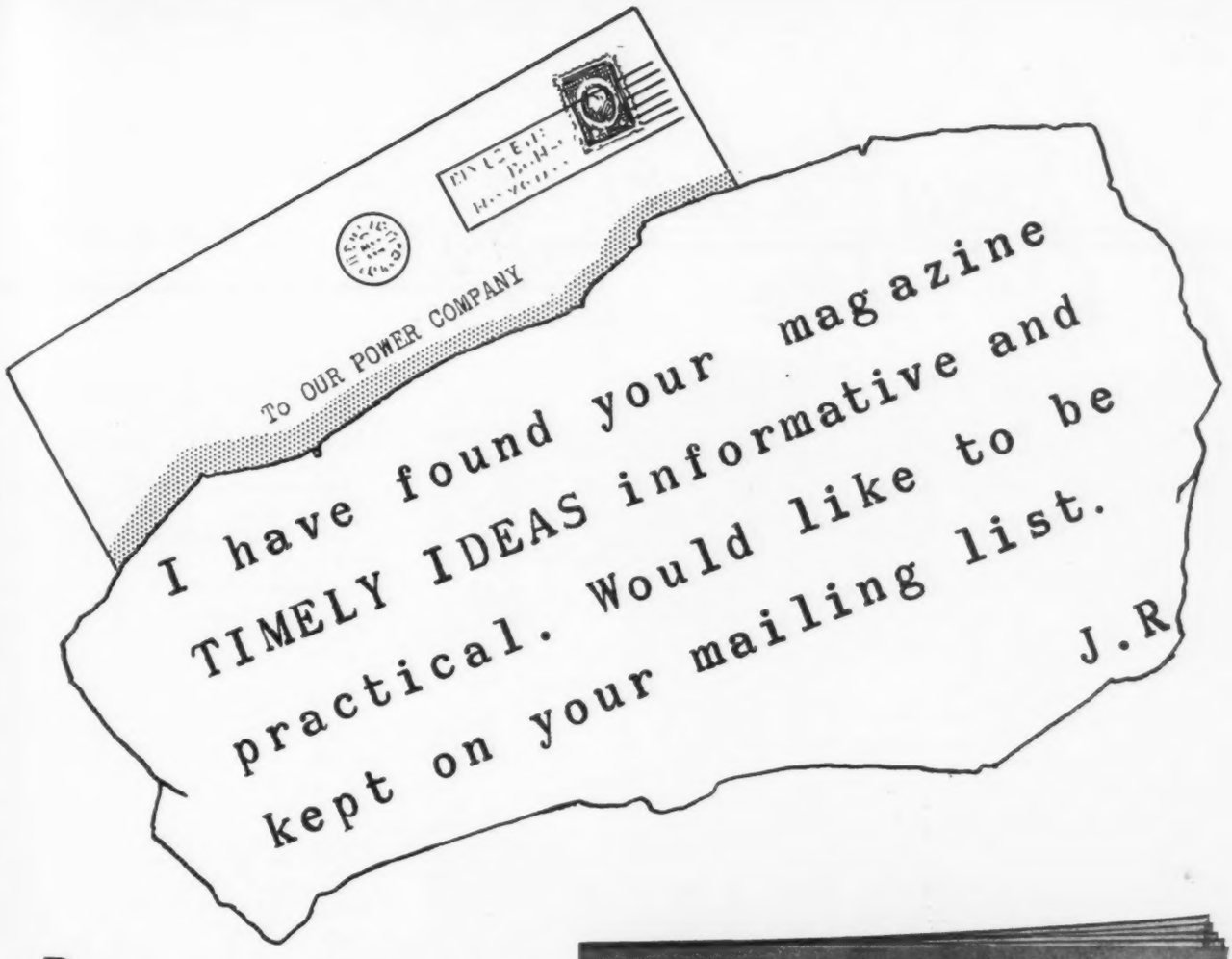
OBITUARY

▶ OTTO J. KRUSE, superintendent of lighting sales for the Milwaukee Electric Railway & Light Company for many years, died at his home in that city September 27, in his sixty-sixth year. He had been associated with the Milwaukee utility since 1906.

▶ THOMAS ELLIOTT, who engaged in power plant construction in various sections of the country, died in Cleveland, Ohio, September 25, at the age of 75. Mr. Elliott had broad experience in electrical construction and design and in the mechanical engineering field.

▶ CARL A. ISAKSON, branch manager of the Westinghouse Electric Supply Company branch at Omaha, died August 28 at Lincoln, following a two days' illness. Mr. Isakson had been branch manager for Westinghouse since 1929, following purchase by that company of the McGraw Electric Company's interests in Omaha. Mr. Isakson was sales manager of the McGraw organization in Omaha when it was taken over by Westinghouse. He was actively identified with all co-operative efforts to promote the local electrical industry, was active in the Omaha Electrical League, of which he was a past-president, and was also active in the Nebraska Electric Association.

▶ HARRY W. FINNELL, a vice-president of the Phelps Dodge Copper Products Corporation, died October 1 in the Lenox Hill Hospital, New York, after an illness of a few days. He was born 57 years ago in Morgantown, W. Va., and attended the University of West Virginia. Before joining the Phelps Dodge copper interests, ten years ago, Mr. Finnell had been sales manager and assistant to the president of the Fairbanks, Morse Company of Chicago. In the World War he served with the War Industries Bureau of Illinois and the War Industries Board in Washington.

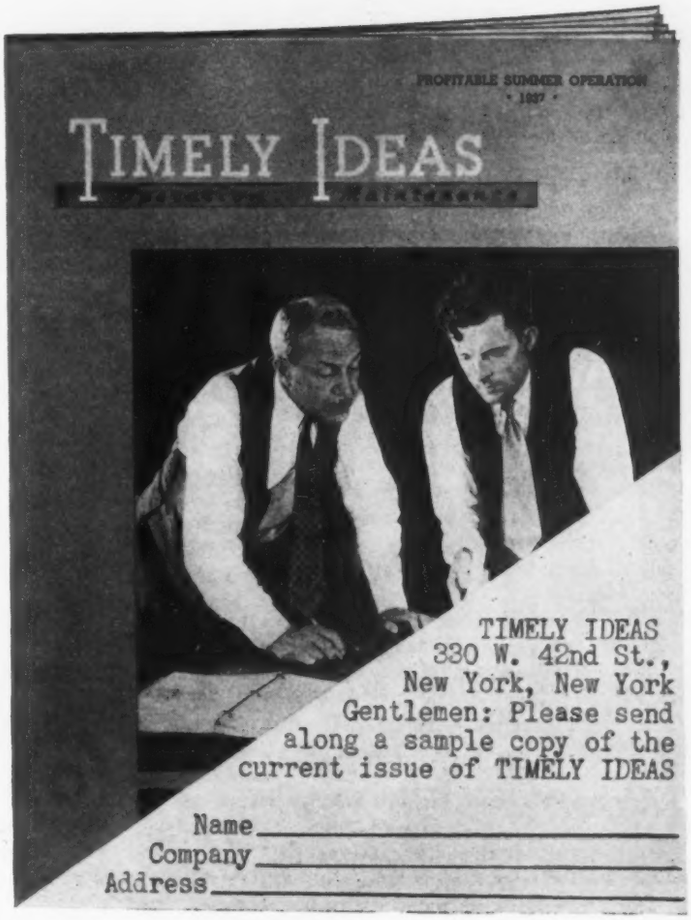

To OUR POWER COMPANY
I have found your magazine TIMELY IDEAS informative and practical. Would like to be kept on your mailing list.
J.R.

POWER company users of TIMELY IDEAS, throughout the country, receive many comments, similar to the above because readers of TIMELY IDEAS find the selected case studies and special plant features not only interesting but useful as well.

TIMELY IDEAS, which is compiled and published by McGraw Hill Electrical Publications, demonstrates the economic advantages of purchased power with new ideas and new equipment—it is designed for easy reading and is aimed at good will and load building. Over 70 of the leading utilities distribute copies to power users in industry.

We will gladly send to Power Company Executives (others 25c in stamps), a sample copy of the current issue so that you too will be familiar with TIMELY IDEAS.

TIMELY IDEAS,
330 West 42nd Street, New York, N. Y.



Manufacturing AND MARKETS

New Pension Plan Offered by Sangamo

Officials of the Sangamo Electric Company, Springfield, Ill., has announced the inauguration of a pension plan for employees of the factory which provides a monthly retirement for life for all employees reaching the age of 65 years who care to participate in the plan. More than 800 employees have signed for participation. The plan is underwritten by the Travelers Insurance Company of Hartford, Conn., through which the monthly disbursements will be made. Employees and the company will make monthly payments into the fund until such time as the employee reaches 65 years of age and the annuity payments start.

The company is providing at its own expense certain annuities for past service for employees who have been with the company after attaining the age of 35 years, and special provisions have been made for employees now over 65 who are not eligible to participate in the plan. The plan is open to all employees who have been with the company prior to January 1, 1938, and to new employees after one year of service. The amount of annuity varies according to earnings and length of service.

•

Electric Vacuum Cleaner Sales in August Advance

Electric vacuum cleaner sales in August staged a comeback, reversing an industry downtrend. Sales totaled 90,557, an increase of 32 per cent over July and 22 per cent below August, 1937. With proportionate decreases lessening, the industry's sales for the eight months of 1938, as reported by C. G. Frantz, executive secretary of the Vacuum Cleaner Manufacturers' Association, total 838,395, or 30 per cent below the same period in 1937.

Continued buying of vacuum cleaners in the upper price levels characterized August business, the average retail price for floor models, constituting the great bulk of the industry's business, being $57.23, compared to $55.93 in August, 1937. For the eight months this year the average price was $60.07, compared to $54.91 in the similar period of 1937.

•

Crocker-Wheeler in Appliance Field

Marking its entry into the home appliance field, Crocker-Wheeler Electric Manufacturing Company, which has specialized in motors, generators and industrial apparatus, has announced a new automatic toaster.

Called the "Toast-O-Lator," the new toaster makes use of a conveying mechanism driven by a shaded-pole motor to carry the bread past the heating elements. The toaster is rated at 700 watts.

•

August Air-Conditioning Installations Make Record

Combined capacity of the central-plant air-conditioning installations sold in Chicago in August made a new all-time high record for that month, according to an announcement made by the Commonwealth Edison Company. Contracts were closed for 22 air-conditioning systems, with an aggregate capacity of 650 hp. This compares with 23 plants, having a total capacity of 405 hp., reported in August, 1937.

In addition to these central-plant air-conditioning plants 58 electric room coolers were sold by Chicago dealers in August, compared with 32 in the same month last year.

•

Grand Coulee Contracts Let

Westinghouse Electric & Manufacturing Company has been awarded a $193,480 contract by PWA for generators. At the same time the PWA announced award of $106,498 contract for turbines to the Pelton Water Wheel Company of San Francisco. The contracts include machinery for two service station units needed for the Grand Coulee power plant.

Electrical Exports Distribution Listed

With imports amounting to 283 units valued at $22,384, out of a total for all countries of 546 units valued at $40,964, the Union of South Africa was the biggest foreign purchaser of American electric ranges during July, according to the Department of Commerce.

Almost the entire exports of steam turbine-generator sets, amounting to $133,253 for July, were taken by two countries, Venezuela accounting for $90,200 and Canada for $41,972 of the total. Japan led in purchases of self-contained lighting outfits, with a total of $42,338, as compared with $11,469 for Peru and $11,186 for Brazil.

July exports of power switches and circuit breakers over 10 amp. were valued at $139,229. About 68 per cent of this total was accounted for by Brazil, Canada, United Kingdom and Netherland West Indies, each of which took about $24,000 in purchases. The Union of South Africa, Australia and New Zealand were the largest purchasers of electric household refrigerators, respectively accounting for purchases valued at $213,518, $79,218 and $71,399.

Soviet Russia and Canada led with purchases of electric furnaces, ovens and heating devices, totaling respectively, $58,930 and $11,906 out of a total of $107,697. The largest portion of exports of electrodes for furnace or electrolytic work continued to go to Soviet Russia, which took $263,656 of the July total of $341,551.

•

Machinery Exports Gain in August Over Previous Month

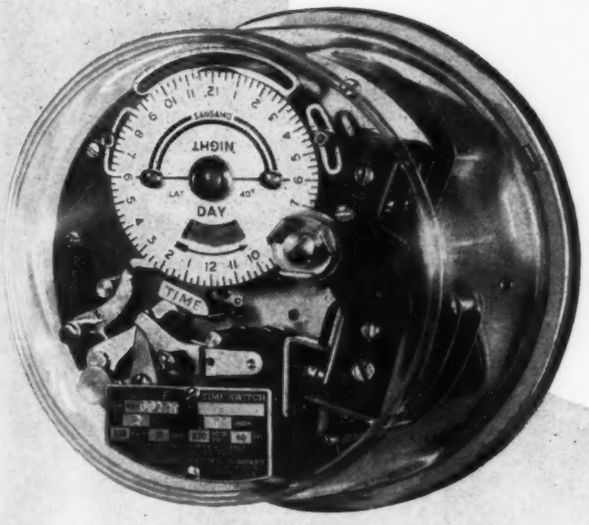
Exports of electrical machinery and apparatus during August totaled $8,084,000, against $8,007,000 in July and $8,984,000 in August last year, according to the Department of Commerce. For the first eight months such exports amounted to $67,837,000, against $74,379,000 in the same period last year.

Exports of household electric refrig-

when control is required at sun set and sun rise

New SANGAMO ASTRONOMIC DIAL TIME-SWITCHES

Form KZ Astronomic Dial Time-Switch in Conventional Case

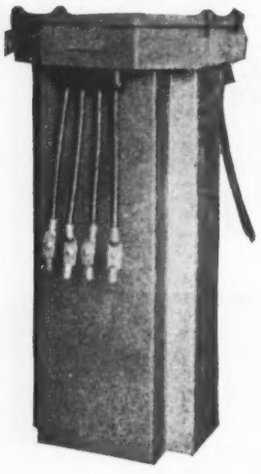


Model F, Form VSFZ Astronomic Dial Time-Switch in Socket Construction.

• All the requirements for accuracy and dependability at low cost have long been fulfilled by the Sangamo Form K, and the Model F, Form VSF Time-Switches. The addition of Astronomic Dials now extends their field of application to operate "on" at sunset and "off" at sunrise daily. The "off" operation may be set at any time between 9:30 P.M. and 2:15 A.M. For street lighting, flood lighting, yard lighting, and display window, outdoor sign and air beacon lighting, these new switches provide automatic convenience at economical first-cost.

Bulletin 87 lists complete information and prices on all Sangamo Time-Switches

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS



Transformers for Today's Requirements

Glance at the list of important design features of AmerTran Type "RS" Distribution Transformers—see below—and you will see that these units possess many refinements which minimize the danger of damage due to usual causes, such as momentary short circuit, lightning surges, overloads of short duration, rough handling, exposure and severe usage. Further, you will note that they are made so that in the event of damage they can be repaired quickly, easily and inexpensively. These features help reduce operating expenses. May we send you Catalog 116 which contains complete data?

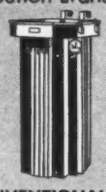
Type "RS" Design Features

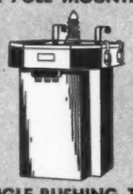
1. May be completely dismantled and reassembled with a wrench.
2. Bushings of coordinated flashover type — quickly replaced (no soldering) yet incapable of syphoning oil.
3. External parts rust resistant — tanks of copper bearing steel; covers cast from nickel-iron alloy.
4. Patented clamps permit removal of coil after end iron only has been taken out.
5. All units are of similar electrical and mechanical design in sizes from 1½ to 100 Kva. and for potentials up to 8,000 Volts.
6. Coils of fully balanced design and with ample ventilating ducts are vacuum impregnated in varnish.
7. Rigid core construction prevents damage due to momentary short circuit or rough handling.
8. All units are shipped filled with oil so as to reduce your transportation and installation expense.
9. Design offers high turn-to-turn insulation and optimum impedance characteristic.
10. Optional feature—lightning protection by Crystal Valve lightning arresters and grounding gaps.

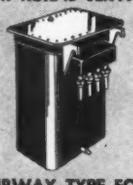
AMERICAN TRANSFORMER CO.
178 Emmet St., Newark, N. J.

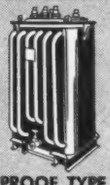
AMERTRAN

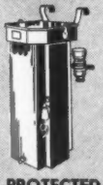
AMERTRAN
Distribution Transformers


CONVENTIONAL TYPE FOR POLE MOUNTING


SINGLE-BUSHING TYPE FOR RURAL SERVICE


SUBWAY TYPE FOR SUBMERSIBLE SERVICE


FIREPROOF TYPE FOR INDOOR INSTALLATION


SURGE-PROTECTED TYPE WITH LIGHTNING ARRESTERS

VAULT TYPE WITH JUNCTION BOXES

CONVENTIONAL TYPE FOR OUTDOOR MOUNTING

UNITS WITH EXTRA FEATURES FOR SPECIAL NEEDS

erators in August numbered 11,443, valued at $934,000, against 12,442, valued at $936,000, in July and 12,423, valued at $959,000, in August last year. For the first eight months such exports were 99,784, valued at $7,475,000, against 130,064, valued at $9,621,000, in the like period a year ago.

•

Manufacturers Make Sales Appointments

Electrical manufacturing companies have recently made the following assignments to their sales staffs:

Electric Machinery Manufacturing Company, Minneapolis, has announced the appointment of Fred G. Guthrie to represent the company in the San Francisco territory. Mr. Guthrie will be located at 420 Market Street.

Tom Carmon has joined the selling organization of the George Butler Electric Sales Company of Chicago, exclusive Midwestern representative for Triangle Conduit & Cable Company, Inc., of New York City. Mr. Carmon is covering the states of Missouri, Kansas and Nebraska with headquarters at Kansas City, Mo. He formerly represented the I. A. Bennett Company.

•

Apex Restores 5% Pay Cut

With the factory payroll in August double that of July, Apex Electrical Manufacturing Company has announced restoration of a 5 per cent wage cut made five months ago. When the cut was made April 1, affecting lower income salaried employees, it was announced restoration would be made as soon as business warranted. Daily production of washing machines was about 700 in August, as against 650 in July and 350 in June, according to company officials.

•

Reports Loss of $123,781

Report of Crocker-Wheeler Electric Manufacturing Company for the six months ended June 30 shows net loss of $123,781 after taxes, depreciation, amortization, etc. This compares with net profit of $103,432, equivalent to 35 cents a share on 290,500 no-par shares of common stock in first half of 1937.

New York Metal Prices

	Sept. 28, 1938 Cents per Pound	Oct. 4, 1938 Cents per Pound
Copper electrolytic	10.375*	10.375*
Lead Am. S. & R. price	5.10	5.10
Antimony	11.25	11.75
Nickel ingot	35.00	35.00
Zinc spot	5.35	5.34
Tin straits	44.125	44.50
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.

Field Reports on Business

Electrical manufacturers have been flooded with emergency orders for equipment following the recent storm. Activity in other lines showed a drop, but signs point to a continued upturn. Recovery from the war scare has aided business sentiment. Appliance sales drives are in force.

NEW ENGLAND

Estimated storm damage to the New England Power Association companies is $3,500,000; to the Boston Edison $1,000,000, both including lost revenue. The New England Telephone & Telegraph Company loss is estimated at $5,000,000. The aftermath of these and other heavy losses is an urgent demand for line material. The New Haven Railroad has strung more than 1,000 miles of new wire and reset 500 poles to date; about 5,000 miles of wire and more than 22,000 poles were required to restore telephone communication to this area. Heavy losses are reported in transformers and domestic meters. Orders amounting to over $90,000 were placed last week for new transformers; more than 6,000 meters have been ruined, which has resulted in several large orders.

About 20 per cent, according to one reliable estimate, of the motors in flooded textile mills will have to be replaced. One manufacturer reports a heavy demand for portable floodlighting units and reports the sales of 75 such units for emergency use in the inundated districts. The flow of supplies needed for repairs and replenishments of stock will continue for several weeks, in the opinion of one distributor.

Small motors are being bought by machine manufacturers with foreign orders. Recently Simplex Wire & Cable Company received from the Schiphol Airport, Amsterdam, Holland, an order for 7,218 feet of 40-conductor No. 14 Latex insulated cable (with waterproof) double-jacketed control cable.

Rural electrification specialists report increased sales of electric farm equipment. Records were broken for weekly sales during the second week in September by a group of Vermont utilities which reported the movement of 104 refrigerators and 43 ranges.

PACIFIC COAST

September business failed to rise above the dead level maintained since last winter except a 20 per cent spurt at midyear. It may be summarized as good from utilities, fair from contractors and dealers, excellent, though spotty, from the government in heavy machinery, line material and army and navy base construction, and good and well distributed from counties and municipalities chiefly with PWA assistance.

The last week of September was marked by many successful large bond elections, such as $3,000,000 San Francisco schools; $2,000,000 Fresno schools; $600,000 Eureka schools, though San Francisco rejected $20,000,000 for other public improvements, including purchase of privately owned traction company.

Power apparatus orders cover $106,498 for two Pelton turbines and $193,480 for two Westinghouse generators for Grand Coulee. Bids are requested for the 15-kva feeder circuit breakers for Bonneville. Low figures for the Kelso-Vancouver, Wash., 220-kva transmission line were $143,897 for aluminum and $179,144 copper; for the 800-mile Bonneville to Grand Coulee tie-in were $792,820. Wholesalers report a fair stimulation of sales by recent steady advances of staples, especially copper wires and steel roughing-in material, countered to some extent by an average 10 per cent drop in the cream of the wiring device lines.

NEW YORK

Rush shipments to take care of emergency orders for equipment to replace wrecked lines and damaged plants resulting from the recent storm have occupied manufacturers the past two weeks. Business has been on a rush basis and reports are that the conditions will continue to exist until rehabilitation is completed.

Retail outlets report a drop in business as a result of the storm and the war scare. Business is beginning to take on normal routine, with expectations that buying will resume on a larger scale. The business show here is attracting a great deal of attention and reports are that exhibitors and prospective purchasers are more optimistic regarding the future. Organized distributors in this area have deferred until next spring the large-scale campaign on refrigerators. It is felt that the spring buying psychology will be better.

Appliance manufacturers feel that the last quarter will produce a good amount of business and exceed any of the three previous ones. An upturn in sales has been noted in many lines. The drive by Consolidated Edison is moving appliances in volume above earlier expectations. Many utilities are pushing I.E.S. campaigns this month and report good response to their efforts. q

Construction contracts have shown another gain, with awards so far this year 6.3 per cent above a year ago. Private awards are higher, a good sign.

CHICAGO

Slight gains in general business activity were apparent in the past week. Industrial production made modest advances, while sales of food products rose to 8 per cent above last year. Appreciable increases in employment and payrolls in most trade groups have been noted during the past month.

Although maintaining an even pace, retail trade has been disappointing and is currently 18 per cent below last year at this time. Wholesalers report an improved demand for early holiday trade. Electric power output in this area fell off slightly from the previous week. Utility purchase declined slightly in dollar value. Appliance and radio sales show a tendency toward improvement. The demand for store-lighting equipment is better, with a number of small jobs in progress.

Electrical permits reveal considerable activity in motor installations, one order totaling 326 fractional-hp. motors. The Belt Railway is spending $1,500,000 for automatic switching equipment in the Chicago yards. A prominent appliance manufacturer reports sales for eight months 29 per cent above the same period in 1937. Additional allotments for line extensions in nearby counties amount to $301,000 for 250 miles.

Reliable
STRAIGHTLINE SPLICES
Copper Straightline Splice
Copper Straightline Reducer
Type A Copperweld Straightline Splice
Steel Straightline Splice
High in strength -- Low in cost -- Positive in performance. Ends fit wire closely, dampening vibrations and preventing insertion of improperly prepared wires. A husky slotted washer maintains spacing of jaws preventing a strand from wedging between them. Jaws grip wire positively without cutting lines in it.
Reliable ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES
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STRAIGHT AND STRONG . . . PROPERLY SEASONED AND GRADED . . . AVAILABLE UNTREATED OR PRESSURE-TREATED WITH CREOSOTE OR WITH "WOLMAN SALTS" PRESERVATIVE . . . Prompt Shipments. Write for Quotations.

JACKSON LUMBER COMPANY

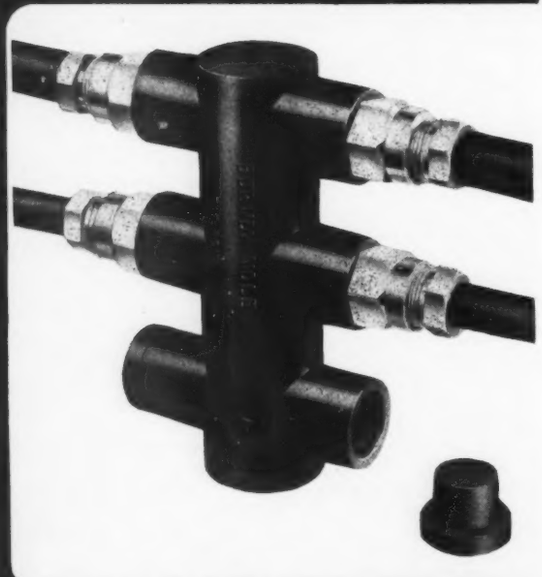
LOCKHART, ALABAMA

A CROSSETT WATZEK GATES INDUSTRY

MOLE

BURNDY INSULATED MULTIPLE TAP CONNECTOR FOR UNDERGROUND DISTRIBUTION

Type ZM, made in a wide variety of sizes, shapes and ampere capacities; fully described in Bulletin No. 787. Write for it.



BURNDY ENGINEERING CO., INC., 459 E. 133rd St., N. Y. C.

Municipal Plants

RUSSELLVILLE, ARK.—In consideration of several concessions granted the city by the Arkansas Power & Light Company, City Council has agreed to drop all plans for a special election called for October 11 to pass on the building of a municipal power and light plant with a PWA loan and grant. The agreement will mean a saving of approximately $3,500 this year to the city, and an annual saving of from $2,500 to $3,000.

EL DORADO, ARK.—City Council voted 4 to 3 to refuse a PWA loan of $365,000 and a $298,000 grant to install a municipal plant. Arkansas Power & Light Company serves the city.

MACCLENNY, FLA.—Circuit Judge A. Z. Adkins has stated that he has granted an injunction, asked by the Florida Power & Light Company, preventing an election to determine whether the city will construct an electric power plant. The utility company contended the proposed plant would operate in competition with its facilities and attorneys pointed to a franchise expiring in 1955.

BONNERS FERRY, IDAHO—Voters have authorized a $99,000 bond issue for the construction of a proposed municipal power plant. Sale of the bonds will provide part of the cost of a plant estimated to cost $290,000. The municipality is seeking a 45 per cent grant from the PWA.

SAGINAW, MICH.—An offer to purchase the Consumers Power Company's electrical distribution system for $3,492,450 has been made by the city council in compliance with a PWA regulation in connection with the city's application for a federal grant to aid in financing construction of a municipally owned $6,100,000 power plant.

LIBERTY, MO.—City Council has passed an ordinance calling for an election October 25 on a $195,000 bond issue to buy or erect an electric power and light system. A grant of $148,500 has been promised from the PWA if the bond issue carries.

ODESSA, MO.—Citizens have voted $76,450 in bonds for financing of a municipal light and power plant and distribution system estimated to cost $139,000. PWA has allotted the city a grant of $63,000 and a loan of $77,000 for this project.

MONROE CITY, MO.—PWA has allotted the city a grant of $32,000 to help finance a municipal light and power plant and distribution system estimated to cost about $71,000.

BELLEVUE, OHIO—Referendum petitions are being circulated calling for a vote on a recently launched $680,000 municipal power plant program enacted by City Council. Only 300 signatures are required to put the question to a vote. The program proposes construction with PWA aid of a municipal power plant, an offer of $115,000 to the Ohio Public Service Company for the distribution system in Bellevue, placing of all wires in the business district underground and construction of a new white way system.

YORK, NEB.—City has filed ouster proceedings in the district court against the Iowa-Nebraska Light & Power Company, claiming it is a necessary step before the city can begin construction of its own power distribution system. The city charged the company, incorporated in Delaware, is a "foreign corporation," and for more than

five years has committed "acts of trespass on city streets and alleys." It alleged the company's claim to a franchise is "pretentious and invalid."

MIDDLETOWN, OHIO—PWA officials at Washington have granted $769,725 to the city for the construction of a municipal electric power plant. City commissioners had requested a grant of $1,200.000 to cover the cost of building the plant and erecting a distribution system. Total cost of the project is expected to be approximately $2,500,000. Voters will pass on a bond issue of $1,400,000 at the November election to cover cost of construction of the plant. City officials are now awaiting a reply from the Cincinnati Gas & Electric Company on an offer of $815,000 for that company's distribution system in Middletown. There is no power plant in the city which receives its power from Cincinnati.

DUNCAN, OKLA.—City has under way plans for a municipal electric power and light plant and distribution system, costing approximately $109,000. PWA has made an allotment for the project.

CASCADE LOCKS, ORE.—City has voted in favor of a proposal to issue revenue bonds up to $90,000 to go in the power business. Bonneville power will be bought wholesale at the transmission line rate of $17.50 per kilowatt-year for primary power and $11.50 for secondary power. The bond issue was earmarked $44,000 for the purchase of the distribution system of the West Coast Power Company between Herman Creek on the Columbia Highway east of the city to Multnomah Falls on the west; $22,000 for extensions and improvements, and $12.000 for working capital. No agreement has actually been reached between the city and the Peoples Light & Power Company, owner of the West Coast Power Company.

STEVENSON, WASH.—This city across the river from Cascade Locks, also served by West Coast Power Company, recently tabled a report of a special committee of three citizens that recommended that Stevenson go into the power business, buying Bonneville power.

LAMPASAS, TEX.—Voters decided in an election September 21 to issue revenue bonds totaling $100.000 for erection of a municipal light plant that would receive power from the Lower Colorado River Authority. The city is at present being served by the Texas Power & Light Company.

HUMBOLDT, TENN.—Voters indorsed by a vote of 423 to 26 an $85,000 bond issue to match a federal grant for the construction of an electric distribution system. TVA power would be used. The city already owns one distribution plant, but it has been operated under lease since 1925 by the West Tennessee Power & Light Company.

HUNTINGTON, TENN.—Carroll County has received a PWA grant and loan to finance the construction of county-wide electric distribution system estimated to cost $900,000.

SUPERIOR, WIS.—Citizens rejected at an election held September 20 the proposed purchase of the Superior Water, Light & Power Company property. At the same time the electorate went on record as favoring continued efforts to purchase the utility at a price less than the $4,189,000 set by the Wisconsin Public Service Commission. A resolution to petition the Public Service Commission to order an immediate reduction in electric, gas and water rates charged by the utility was introduced before the City Council September 21.

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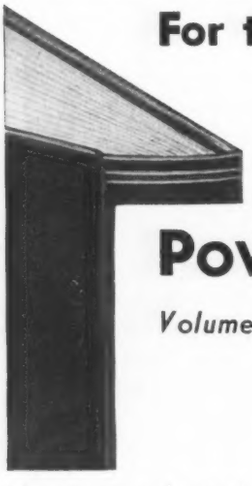

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Rural Allotments; Contracts Awarded

Among the recent rural allotments announced by REA are the following:

GEORGIA—Washington County Electric Membership Corporation, Sandersville, S. M. Cox, superintendent, $218,000 to build 242 miles of line, 903 customers, in Washington, Johnson, Hancock, Warren and Emanuel counties. Forsyth County Rural Electric Association, Cumming, M. A. Smith, president, $159,000 to build 151 miles of line, 849 customers, in Forsyth, Fulton, and Cherokee counties. Habersham Electric Membership Corporation, Clarkesville, J. P. Fitts, president, $183,000 to build 180 miles of line, 940 customers, in Habersham, Hall, White and Rabun counties. Jackson Electric Membership Corporation, Jefferson, George N. Stovall, president, $284,000 to build 282 miles of line, 1,441 customers in Barrow, Jackson, Hall, Gwinnett, Madison, Banks and Clark counties. Three-Notch Electric Membership Corporation, Donalsonville, C. E. Martin, president, $300,000 to build 279 miles of line, 1,370 customers, in Early, Seminole, Miller and Decatur counties.

ILLINOIS—Menard Electric Co-operative, Petersburg, A. E. Becker, superintendent, $299,000 to build 285 miles of line, 824 customers, in Mason, Tazewell, Logan, Menard, Sangamon, Macon and Cass counties.

INDIANA—Wabash County REMC, Wabash, G. Gordon Downey, superintendent, $118,000 to build 104 miles of line, 326 customers, in Wabash, Miami and Grant counties. Jasper County REMC, Rensselaer, Francis E. Schroer, president, $241,000 to build 225 miles of line, 736 customers, in Jasper County. Orange County REMC, Orleans, Frank H. Allen, president, $128,000 to build 116 miles of line, 416 customers, in Orange County.

IOWA—Linn County Rural Electric Co-operative Association, Marion, Glenn Stoner, president, $228,000 to build 206 miles of line, 570 customers, in Linn County. T.I.P. Rural Electric Co-operative, Brooklyn, Irvin L. Nervig, superintendent, $148,000 to build 137 miles of line, 369 customers, in Tama, Iowa and Poweshiek counties.

KENTUCKY — Salt River Electric Co-operative Corporation, Inc., Bardstown, Ralph S. Frizzell, superintendent, $127,000 to build 106 miles of line, 387 customers, in Nelson, Bullett, Washington, Spencer and Hardin counties.

MICHIGAN—Top-O-Michigan Rural Electric Company, Boyne City, Thomas A. Colter, superintendent, $452,000 to build 352 miles of line, 1,715 customers, in Emmet, Cheboygan, Antrim, Charlevoix, Otsego counties, and Beaver Island and for the building of a small generating plant on Beaver Island. Western Michigan Electric Co-operative, Scottsville, Louis Rohrmoser, president, $334,000 to build 284 miles of line, 1,143 customers, in Mason County.

MINNESOTA—Federated Rural Electric Association, Jackson, Paul Ferguson, superintendent, $225,000 to build 211 miles of line, 595 customers, in Martin, Jackson, and Faribault counties. Southwestern Minnesota Co-operative Electric Association, Woodstock, O. R. Hamer, president, $131,000 to build 111 miles of line, 285 customers, in Pipestone County.

MISSISSIPPI—Four-County Electric Power Association, Columbus, W. G. Evans,

president, $193,000 to build 340 miles of line, 945 customers, in Lowndes, Oktibbeha, Clay, Noxubee, and Monroe counties.

MISSOURI — Consolidated Electric Co-operative, Mexico, C. M. Fox, president, $246,000 to build 250 miles of line, 695 customers, in Audrain and Monroe counties.

MONTANA—Jefferson Valley Rural Electric Co-operative, Inc., Whitehall, William Heaston, superintendent, $118,000 to build 105 miles of line, 246 customers, in Jefferson, Madison, Silver Bow and Beaverhead counties.

OKLAHOMA — Earl W. Baker Utilities Company, Bethany, Earl W. Baker, president, $111,500 to build 142 miles of line, 437 customers, in Oklahoma, Canadian and Logan counties.

OREGON — Oregon-West Douglas Power Co-operative, Camas Valley, M. L. Hallmark, attorney, $132,000 to build 110 miles of line, 376 customers, in Douglas county.

TEXAS—Hill County Electric Co-operative, Inc., Itasca, E. D. H. Farrow, superintendent, $147,000 to build 167 miles of line, 504 customers, in Ellis, Hill, Johnson and McLennan counties. Magic Valley Electric Co-operative Association, Mercedes, J. H. Levermann, superintendent, $236,000 to build 287 miles of line, 706 customers, in Hidalgo, Cameron and Willacy counties. South Plains Electric Co-operative, Lubbock, Charles C. Fagg, superintendent, $140,000 to build 155 miles of line, 454 customers, in Crosby, Lubbock, Hale, Hockley and Lynn counties. Cooke County Electric Co-operative Association, Muenster, Barnard Voth, president, $178,000 to build 201 miles of line, 587 customers, in Cooke, Denton and Montague counties.

UTAH—Garkane Power Company, Orderville, Ralph B. Blackburn, president, $177,000 to build 118 miles of line, 577 customers, in Garfield and Kane counties, and a generating plant.

Construction contracts:

Jefferson County Electric Membership Corporation, Louisville, Ga., James B. Polhill, Jr., superintendent, and J. B. McCrary, Atlanta, engineer, contract to Richards Brothers Construction Company, Carrollton, for building second section of project, consisting of 182 miles of line, 604 customers; bid, $112,753.

Wright County Rural Electric Co-operative, Clarion, Iowa, George C. Kirkstein, superintendent, and K. R. Brown, Des Moines, engineer, contract to Sandberg & Johnston Company, Hampton, Iowa, for building second section of project, consisting of 176 miles of line, 410 customers; bid $103,204.

Hancock County Rural Electric Co-operative, Garner, Iowa, Verne L. Hein, superintendent, and K. R. Brown, Des Moines, engineer, contract to Sandberg & Johnston, for building second section of project, consisting of 231 miles of line, 426 customers; bid $133,673.

Hardin County Rural Electric Co-operative, Iowa Falls, Iowa, Ben Jaspers, superintendent, and K. R. Brown, Des Moines, engineer, contract to Midland Construction Company, Inc., Chicago, Ill., for building second section of project, consisting of 169 miles of line, 349 customers; bid $108,885.

Tallahatchie Valley Electric Power Association, Batesville, Miss., William H. Saxton, superintendent, and Thomas H. Allen, engineer, contract to the Stuart C. Irby Company, Jackson, Miss., for building entire project, consisting of 271 miles of line, 800 farms; bid $184,814.

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Sales Opportunities

BALTIMORE, MD.—Consolidated Gas, Electric Light & Power Company is considering expansion and improvements in Westport electric generating station, including installation of a new turbo-generator unit, high-pressure boilers to replace existing low-pressure units, and complete auxiliary equipment.

FREMONT, NEB.—Board of Public Utilities has plans maturing for extensions and improvements in transmission and distributing lines, including new 33,000-volt power lines with substation unit, about 2000 lineal feet of new underground conduit lines in business district with power substation facilities. Also new metalclad switchgear installation in main distribution substation and auxiliary equipment. Entire project will cost about $280,000. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

CHICAGO, ILL.—Clorox Chemical Company, 850 Forty-second Avenue, Oakland, Calif., plans installation of motors and controls, regulators, conveyors and other equipment in new multi-story plant at Fifty-first Street and Merrimac Avenue, Chicago, where site has been selected, for manufacture of cleaning compounds and kindred chemical products. Work is scheduled to begin soon. Cost about $300,000.

BROOKLYN, N. Y.—Signal Corps Procurement District, Army Base, 58th Street and First Avenue, Brooklyn, receives bids until October 17 for 400,640 lineal feet of wire and cable on 20 reels; 100,000 lineal feet of cable on 100 reels; 29,700 lineal feet of cable on 19 reels; 43,600 lineal feet of cable on 44 reels; 10,450 lineal feet of cable on seven reels; 1900 lineal feet of cable on one reel; 120 lineal feet of cable on one reel; and 800 lineal feet of cable on one reel (Circular 47).

ABBEVILLE, LA.—Plans extensions and improvements in municipal electric power plant, including installation of additional equipment. Cost estimated close to $100,000.

LINCOLN, NEB.—Iowa-Nebraska Light & Power Company, Lincoln, plans extensions in primary and secondary lines for additions in rural electric system. Application has been made for permission.

SAGINAW, MICH.—City Council, L. T. Cookingham, city manager, has engaged Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., consulting engineer, to prepare plans for new municipal electric generating station and distributing system, with installation of turbo-generator units, high-pressure boilers and auxiliary equipment. Cost estimated close to $6,000,000. Financing is being arranged through federal aid.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, receives bids until October 17 for designing, furnishing, erecting and testing one 64,000-kva. vertical a.c. generating unit with accessories for Hiwassee hydroelectric generating station, 0.9 power factor, to operate at 120 r.p.m.

DANVILLE, ILL.—Chicago & Eastern Illinois Railway Company, 332 South Michigan Avenue, Chicago, Ill., plans installation of motors and controls, regulators, conveyors and other equipment in new coach construction and repair shop at locomotive and car repair works at Danville, to replace a shop destroyed by fire. Cost over $200,000. J. S.

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McBride, Sixty-sixth Street and Union Avenue, Danville, is engineer.

HASTINGS, NEB.—Central Nebraska Public Power and Irrigation District, Hastings, plans extensions in transmission lines to furnish service at Elwood, Heartwell, Edison, Milligan, Grafton and Gresham, Neb., with power substations at town limits to connect with distributing systems to be installed in each municipality. Financing for latter work is being arranged by the different communities through federal aid, with estimated costs as follows: Elwood, $25,000; Heartwell, $10,500; Edison, $15,000; Milligan, $22,000; Grafton, $17,500; and Gresham, $30,500. Proposed to begin work soon. George E. Johnson, general manager, Central Nebraska district, is engineer for all installations noted.

CLEVELAND, OHIO—Department of Public Utilities, City Hall, Frank O. Wallene, director, has plans maturing for new additions to municipal electric power plant at Lake Erie waterfront and East 53d Street, comprising extension in turbine room, 50x60 feet and 50x75 feet, and wing addition, 30x137 feet. Work will include installation of new 25,000-kw. steam turbo-generator unit with accessories, boilers and complete auxiliary equipment. Also, extensions in power substations, transmission and distributing lines. Expansion is estimated to cost about $5,460,000, of which $2,457,639 has been secured through a federal grant. L. A. Quayle, first noted address, is engineer for department.

NEW BOSTON, ILL.—United States Engineer Office, Clock Tower Building, Rock Island, Ill., receives bids until October 13 for power, control and lighting system at Lock and Dam No. 17, Mississippi River, near New Boston, including lock lighting system transformers and regulators, switchboard, remote control switch cabinet, incoming feeder line, lock grounding system, dam power feeder lines and connections, dam conduit system, dam lighting system, transformers and accessories, lock lighting system, navigation lighting system, dam operating house lighting system, signal system, gasoline-electric standby power unit, electric tow-haulage unit, central control station service power and lighting system feeders and automatic emergency lighting system, electric-operated pumping machinery and complete auxiliary equipment.

EUGENE, ORE.—Has plans under way for new municipal electric power plant unit, to supplement present station. Cost approximately $600,000, of which $269,623 will be represented by a federal grant. H. P. Currin is engineer and superintendent of electrical department.

BONNEVILLE, ORE.—United States Engineer Office, Bonneville, receives bids until October 14 for designing, manufacturing and delivering quantity of 15-kv. feeder circuit breakers and metal-enclosed buses for Bonneville hydro-electric power project.

WEST PLAINS, MO.—Plans new municipal electric power plant. Cost estimated at $159,000, with equipment. Financing in part is being arranged through federal aid. M. S. Hogan is city engineer.

KNOXVILLE, TENN.—Has plans under way for expansion and modernization in municipal power plant, heretofore a central station of Tennessee Public Service Company and recently acquired for municipal operation. New equipment will be installed for increased capacity. Cost close to $1,000,000, of which about $450,000 will be arranged through federal grant.

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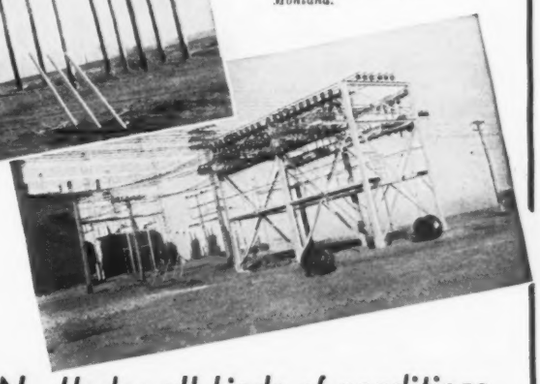

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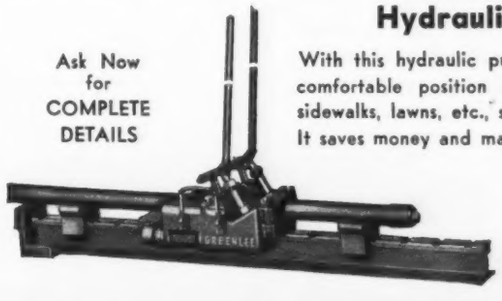

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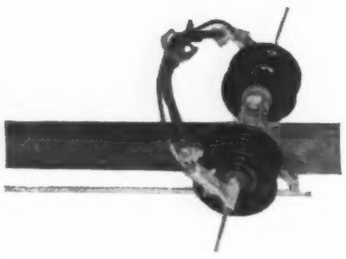

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[*Continued from page 51*]

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A Sudeten Peace

[*Continued from page 82*]

has ever been made. He pointed out that power could be produced more cheaply from coal, and that its production from coal meant more labor and hence greater prosperity. He said this was true even if mine wages should be higher.

But, strong as Mr. Lewis has seemed to be with the White House, and with the daddy of the Coal Commission, Senator Guffey, it is not of record that the Coal Commission has got hot and bothered about any hydro-electric development.

•

EHFA Signs New Contracts

EHFA has announced that contracts had been closed with the Southern Nebraska Rural Public Power District, Minden, Neb.; Douglas County Electric Membership Corporation, Douglasville, Ga., and the Clay Electric Cooperative Association, Inc., Keystone Heights, Fla. Contracts have also been closed with the Vernon Electric Cooperative, Westby, Wis., Board of Public Works, Anderson, Ind.; city of Lansing, Mich., and the Southern Maryland Tri-County Co-operative Association, Inc., La Plata, Md.

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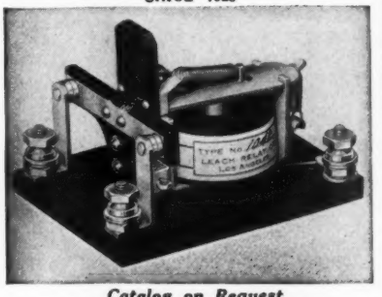

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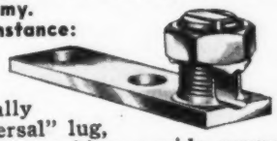

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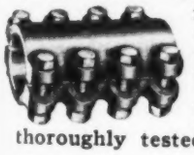

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Advanced Methods of Control Room Lighting

[*Continued from page 79*]

for a trial installation of the stainless steel material. It was felt that, although the first cost of stainless steel is greater than stretcher level steel, the elimination of the painting problem might make the costs somewhat comparable and reduce maintenance expense. However, three years' operation with the stainless steel finish has not brought out any outstanding advantage over the aluminum lacquired finish, and has indicated a decided disadvantage in higher first cost and the difficulty of eliminating glare in the stainless steel finish, even when rubbed with fine steel wool. Also, some discoloration occurs with age, which requires periodic resurfacing with the wool.

Totally indirect superior

Best results will be obtained in the design of a new control-room lighting installation by use of totally indirect units and by reducing the area of dark surfaces to a minimum, such as using light-colored switchboards and dropping the dado as low as practicable, to 30 in. if possible, and not greater than 4 ft. in any case. The indirect units may be porcelain or metal bowls suspended from the ceilings, tubular units concealed behind moldings, or a greater number of individual units of lower wattage located behind vertical switchboard panels, where the switchboards are favorably located to obtain distribution of light by this method.

Ceilings in control rooms should be painted either white or light ivory, with walls just a shade darker. In either case the finish should be eggshell. The reflection factor of this finish is high, at least 80 per cent, and its soft, velvety surface produces a minimum of glare. Light intensities should not be less than 10 ft.-candles, preferably 18 or 20.

One annoying problem in connection with control-room lighting is the glare from windows, especially on dark days, and near sunrise or sunset. Consideration should be given in the new installation to complete omission of all windows. This removes a serious glare problem and leaves the space normally occupied by windows free for accommodation of conduits and other equipment. It is sometimes necessary, where win-

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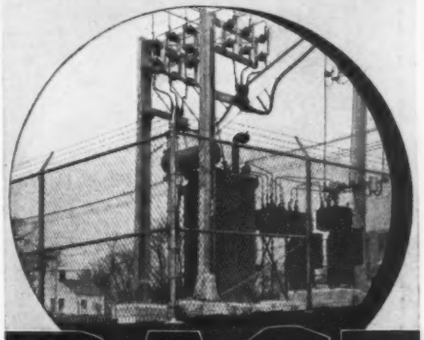

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dow glare reduces visibility of control boards, to install some form of concealed floodlights to illuminate the board and offset the glare. An installation of this type has been made in one of the substation control rooms.

Visibility of switchboards, regardless of finish, is materially improved by the use of flush-type devices. Elimination of a variety of observation levels not only improves the appearance of the switchboard but assists the lighting engineer in obtaining an even intensity over the switchboard surface.

Mercury holds promise

Although the high-pressure, high-intensity type of mercury-vapor lamp appears to offer considerable promise for application to station lighting, it has not been used extensively, chiefly because of certain inherent disadvantages. The principal disadvantage is the delay of several minutes in coming to brilliancy, and the even greater time required for restarting following a loss of voltage on the unit. Another objectionable feature is the lack of red in the mercury-vapor color spectrum, which results in a color distortion, causing red shades and colors to appear brown or purple. Both of these objectionable features can be reduced to negligible quantities by installing fixtures equipped for both mercury and incandescent units.

Incandescent lamps provide the necessary red rays, which, when blended with the light from the mercury-vapor units, result in a soft, diffused white light, simulating natural daylight. A decided stroboscopic effect is noticeable with an excessive proportion of mercury in the combination which under certain conditions may cause distortion of the synchronoscope indication while synchronizing. The low-pressure mercury tube is available for use with conventional fixtures and does not have the troublesome stroboscopic effect or long starting period, although it is somewhat higher in cost and much lower in efficiency than the high-pressure tube.

The high-pressure mercury unit has an efficiency nearly double that of the conventional incandescent lamp and the quality of light produced by mercury-vapor lamps is pleasing and restful to the eyes, an important factor in maintaining the highest efficiency in operating personnel. For this reason wider application of mercury-vapor lamps in future station designs may be expected.

Experiments with fixtures using high-pressure and low-pressure mercury units in combination with incandescent lamps are being conducted in the control rooms of several generating stations and results of preliminary tests indicate that some combination of mercury and incandescent units will give very satisfactory results. An installation of fourteen combination 250-watt high-pressure mercury with 500-watt incandescent units will soon be placed in service in one of the generating station control rooms.

Phase Shifter's Function in System Development

[*Continued from page 52*]

oil circuit breakers and a phase-shifting regulator, to allow control of the power feeding into the North Omaha 13-kv. system from the 66-kv. loop. This regulator provides 10.2 deg. maximum shift in seventeen steps. Some consideration is being given to making this installation automatic by the use of a contact-making ammeter. Such a control would limit the load under abnormal circuit conditions and prevent overloading of the equipment. No overload protection is provided on the phase-angle regulator at present since it has the same current capacity as the 66-kv. step-down transformer, which feeds through it. The transformer is provided with thermal overload alarm equipment.

Since the northwest portion of the city has experienced the greatest residential growth and the existing 13-kv. feeders are now approaching maximum loading, tentative plans for relief of the 13-kv. system by the installation of a step-down transformer and phase-shifting installation west of the city are being considered. When the service from the 66-kv. loop becomes sufficiently firmed through additional ties the 13-kv. mesh may be somewhat altered, approaching radial feeders extending inward to the city load from the step-down installations connected to the loop. A reduction in fault currents can thereby be made and a simple relaying system may be maintained.

Thus, in system planning work, the application of phase-shifting installations frequently answers a very important economic question when justification for expenditures for equipment of a more permanent character cannot definitely be made.

BOOK REVIEWS

Public Utility Regulation

By G. Lloyd Wilson, James M. Herring, and Roland B. Eutsler. Published by McGraw-Hill Publishing Company, 330 West 42d Street, New York, N. Y. 571 pages. Price, $4.

Apparently the major premise here is "that a crisis in public control has been reached wherein the prospect of failure must be faced . . ." and the major conclusion is that "as a substitute for regulation public ownership and operation would at a single stroke eliminate many of the serious defects in the present administration of public utility services." In the intervening 550 pages the tone and temper is quite consistently in antipathy to most of what the utilities and much of what the commissions and courts have done. Although in discussing the orthodox categories of regulation it is stated that "reliance is placed chiefly upon regimentation rather than uncontrolled competition for adequate services at reasonable rates," nevertheless the authors seem to view uncontrolled competition (when precipitated by the Washington administration) as substantially superior to state commission regulation.

Otherwise it is not understandable why in a book entitled "Public Utility Regulation" they should devote practically one-fifth of the pages to a discussion of the New Deal's policies and programs. Incongruous as it may seem to include this material, many readers who are familiar with predecessor books will probably conclude, however, that this book's greatest value rests in that very outline of national power policy, the federal Power Commission, the various power projects and the development of rural electrification. Unfortunately, some of the fallacious declarations of administrators are given the semblance of gospel.

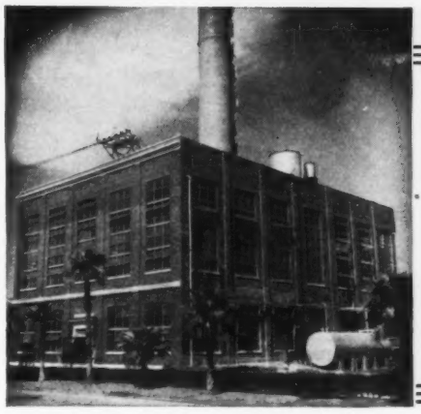
Incidentally the authors seem not to have heard of the movement toward continuous property records as an alternative to elaborate valuation proceedings when rates are questioned. Nor do they make it clear how quality of service can be dictated by local authorities (as advocated) without creating an impossible situation for a state commission which regulates rates (as advocated) because the former is an inherent factor in the latter. The book is partial toward the prudent investment theory, but omits giving a concise definition. Many passages use the present tense verb for phenomena that some time since metamorphosed into distinctly different manifestations.

•

Transformer Engineering

By L. F. Blume, G. Camilli, A. Boyajian and V. M Montsinger. Published by John Wiley & Sons, New York. 496 pages, illustrated. Price, $5.

These four specialists of the General Electric transformer division have written a treatise for the user rather than the designer. Mathematics and vectors and symmetrical components are used in the development, but not at the expense of painstaking verbal explanation of the phenomena of the transformer. Practicality for the user of transformers is indicated by the following typical topics amply discussed: In-rush currents, parallel-operation load division,



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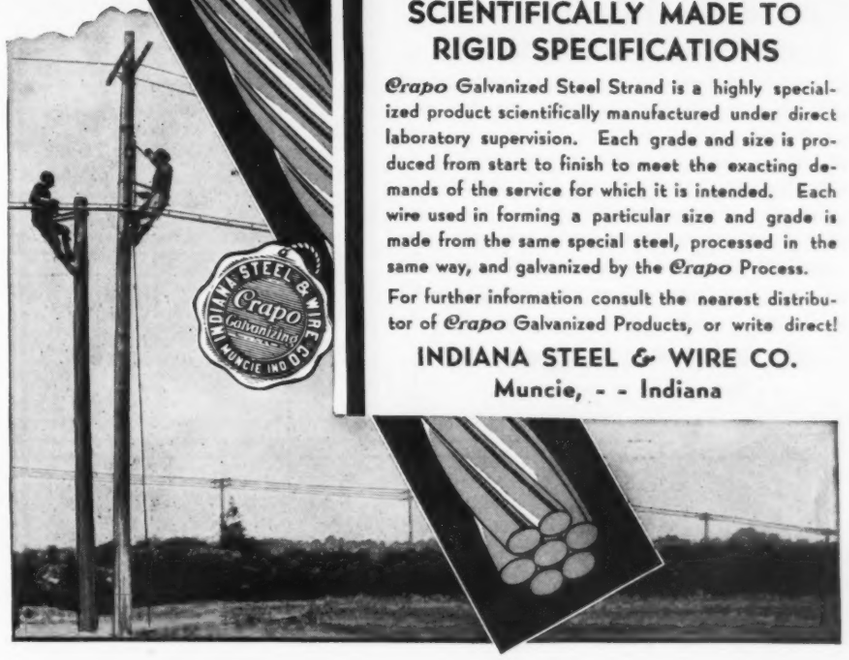

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mesh equivalents of multi-circuit transformers, connections under all common polyphase connections and transformation, and the auto-transformer. The thermal and dielectric phases are expounded primarily in terms of the standardization rules in force and in some cases, in process of adoption. Tabular data in this section are of particular significance to operating men, especially those who are prone to push transformers nearer their safe limits.

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Welding Handbook

Published by American Welding Society, 33 West 39th Street, New York. 1211 pages, illustrated. Price to members, $5; non-members in U. S., $6; foreign, $6.50.

Hardly a more authentic and balanced handbook can be conceived than one which an entire professional society sponsors and collaborates. Ninety authors contributed their special knowledge to as many sections of the 60 chapters and each was reviewed and edited by several other experts. All prevailing forms of electric and thermal welding are covered, along with arc cutting, brazing, metal spraying, flame hardening and stress relief.

Symbols, working drawings, photos of operations are a plentiful alternative to views of the mere apparatus of the art. Apparatus characteristics and controls are, however, amply discussed. Ten chapters are devoted to the technique of welding steels (carbon, chromium, nickel and manganese), copper, nickel and aluminum (and their alloys). A section on testing records, the society's committee report on standard qualification procedure, presents details of non-destructive tests, inspection methods for pressure vessels and a portrayal of testing practices employed by the U. S. Navy.

Twenty chapters closing the book treat the safety aspects and accessories employed in the welding art and the types of welding work done in such fields as shipbuilding, pressure vessels (including boilers), pipe lines, machine frames, buildings and bridges. There are also an extensive bibliography and a brief collection of tabular appendices. Interspersed through the text are many more items of practical operating data and performance results.

•

Electric Power Circuits
Vol. II—Power System Stability

By O. G. C. Dahl. Published by McGraw-Hill Book Company, 330 West 42d Street, New York, N. Y. 698 pages, illustrated. Price, $7.

No one is better known for his analytical investigation of power system stability than Professor Dahl, and the prompt availability of his book should therefore facilitate more economic use of the capital devoted to power transmission. Of course, both steady state and transient stability are treated. The line itself is subjected to both analytical and graphical analysis and then the terminal elements are brought into the progressively complicating pattern. All the likely eventualities are embraced through the medium of a large number of numerical problems solved in elaborate detail. In the latter half (under transient stability) much emphasis is placed on the characteristics of the excitation and voltage regulation facilities in so far as they aggravate the predisposition of the system to become unstable. Inertia of rotating equipments and their shaft loads are amply treated and there is a brief discussion of the merits of neutral grounding. In view of the rising interest in the efficacy of the Petersen coil in aiding relief of system faults it is unfortunate that no mention is made of it in this connection as a possible remedy for some of the initiations of instability.

Recognition will quickly be given to this book as the standard treatise of the still largely obscure (even to engineers) phenomena which prevent power systems from doing their best for fewest dollars. It is both highly mathematical and highly practical, having the latter attribute because the author has been so intimately engaged in studying the stability problems of actual systems as to appreciate the need for setting down the practical generalizations that can be deduced from critical analyses. The book is further rendered of direct value to the practising engineer who wants more than a short-circuit board answer to his problems because it incorporates at appropriate points the short-cut empirical factors and data for typical machines and systems that help to shorten the labor of a rigorous solution.

•

Metallische Uberzüge
(Metallic Coatings)

By Eugen Werner. Published by Carl Hanser Verlag, Munich. 163 pages, 57 illustrations. Price, 4 reichsmarks.

This is one of a series of "Shop Kinks." Practical advice is given for electroplating various kinds of metals—nickel, chromium, copper and others—and for the application of protective and ornamental coatings.

•

Service Charges in Gas and Electric Rates

By H. F. Havlik. Published by Columbia University Press, New York. 222 pages. Price, $2.75.

Well-documented, this study, inspired by Professor Bonbright, focuses attention on the service or customer charge once so commonly embraced in utility rates. It states the case quite well, acknowledging the objectives of discrimination elimination and of a promotional influence. However, on the former point the author says it would be "quite consistent with the quasi-public nature of public service rates for social purposes rather than merely for private ends." Another objection to the practice is the persistence of public opposition to the Doherty innovation. Later the author favors the so-called initial charge, adding that "the minimum charge might" (as an alternative) "well be employed with a block-rate which, by offering low increment rates, raises domestic consumption to high levels."

In general, the book would be more effective if it gave more credence to the view that rate levels and rate components have to produce a non-confiscatory return in the face of troublesomely high percentages of competitive users and of uncompensatorily low users—appendices, however, give ample data on the economic limitations of the various customer classes. There is a generous bibliography of references on pertinent aspects of the problem confronting electric and gas utilities.

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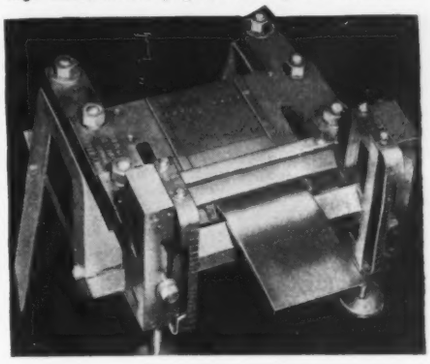

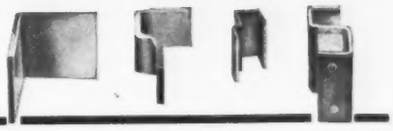

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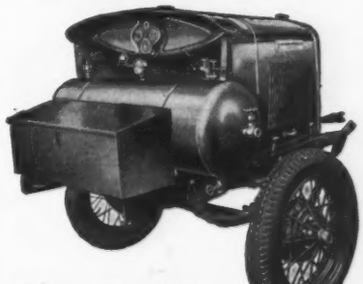

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ELECTRICAL ENGINEER New York State license. 20 years experience design power-plant substations, transmission and distribution, estimates, specifications and costs for utility companies. Desires connection with operating company or consultants. Age 46, married, available on short notice. PW-551, Electrical World, 330 West 42nd Street, New York City.

BUSINESS OPPORTUNITY

Wanted: Alert Young Man

To take half interest old established electrical manufacturing business; $5000 required. Kaufmann, 208 W. Kinzie, Chicago.

SELLING OPPORTUNITIES OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY OFFERED

SALES ENGINEER to take charge of District Office of large manufacturer selling nationally. Age between 33 and 40 years. Must be electrical engineering graduate. Give age, education, experience, references first letter. Replies treated confidential. SW-548, Electrical World, 520 No. Michigan Avenue, Chicago, Illinois.

OPPORTUNITY WANTED

SALESMAN: Technically trained desires profitable connection in South America Selling electrical supplies and apparatus through jobber or manufacturer's outlet—12 years experience with large concern—Age 32 years—Single—Available upon 30 days notice—Employed at present. SA-549, Electrical World, 330 West 42nd Street, New York City.

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Provide an indexing or subject word.

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